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Contributions.

Relative Value of Firebox and Tube Surface.

NEW YORK, Dec. 8, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The writer has been much interested in the discussion on the relative value of direct, as against tube-heating surface. The statement that one square foot of direct, or firebox, heating surface, is equal to 10 of tube surface, has generally been accepted as being correct by locomotive men; and while it may not be exact, it is an expression of a well-known fact, *i. e.*, that heating surface exposed to direct radiant heat and to the heat of flame that has not been cooled by contact with cooling surfaces, is very much more effective than tube surface, that can only act as an absorbent of heat of gases resulting from perfect combustion. It is well known that the first four feet of the tubes of a locomotive take up a very large percentage of the heat that is absorbed by the whole length of the tube. This was thoroughly demonstrated by dividing a locomotive boiler into sections, and noticing the evaporation of each section. Mr. Dean is an advocate of, and believes very strongly in, internally-fired boilers for stationary work, and why? Because he knows that the radiated heat of the fire goes direct to the water, and is not absorbed by surrounding brick-work. Then why should a locomotive boiler have a brick firebox with all the heat generated within its incandescent space to be concentrated on the tube sheet and on the tubes that give trouble enough under ordinary conditions, and will not stand the concentrated action of the flame, from a brick lined firebox? This I have tried and found that on a boiler that had been used for years without a leaky tube, it required less than a week of service with the brick-lined combustion chamber to start all the tubes leaking, so that we had to take out the brick lining.

A few years ago a scheme was started for setting ordinary return tubular boilers with a retort in front, with the boiler built into the back of the retort, and all the products of combustion being delivered direct to the tubes. This was soon abandoned for the same reason. The concentrated heat of the retort was enough to drive the water away from the tube sheet and the tubes would leak.

Now, the modern locomotive requires all the heating surface and grate area that can be secured, and why discuss the use of small fireboxes, after the facts as brought out by Professor Goss' paper and experiments? Plenty of tube surface is a good thing to reduce the temperature of the gases to the lowest possible point before allowing them to escape, as the ordinary temperatures of the smokebox of American locomotives will run above 900 deg., while good stationary practice is 400 deg. While a tube should not be too long, there should be enough of them, so the velocity of the gases will be reduced, and the grate should be large enough to burn the amount of coal required to do the work, with a blast that will fan the fire without pulling it to pieces, or carrying the coal through the stack, and the more heating surface we can get within the influence of the radiant heat of the fire, the better we will be off.

I witnessed a test only last week of an internally fired stationary boiler that had 1,800 sq. ft. of heating surface and 24 sq. ft. of grate, that showed 349 H. P. when evaporation was more than 12 pounds of water per pound of bituminous slack coal, the horse-power being reckoned at 30 pounds of water, and while showing this remarkable result the temperature of the uptake was only 400 deg. Fahr., and while burning this low-grade coal perfect combustion was obtained, so that the stack was as clear as if the best anthracite were being used.

This was a consumption of about 40 lbs. of coal to the square foot of grate and was a horse-power allowing 30 lbs. of water per horse-power for a little over five square feet of heating surface, and 14 H. P. per square foot of grate while showing over 12 lbs. evaporation per pound of coal, demonstrating very clearly that high rates of evaporation and high rates of combustion are not necessarily wasteful.

GEO. S. STRONG.

The Education of Railroad Men.

CHICAGO, Dec. 1.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am on the side of those who would oppose the proposition to establish a college course for railroad men. To thoroughly educate a young man for the profession of a railroad officer, he should have the preliminary training acquired by the regular college course, and then devote a post-graduate course for the special subjects required in his profession, precisely in the same manner as is pursued by those desiring to follow the profession of law, medicine or the ministry. The career of a railroad man, to one having good abilities and a thorough education in his profession, offers as many hopes of reward as that of either of the so-called learned professions. Why should not, therefore, the candidate for it prepare himself with equal care and equal thoroughness?

My belief is that the proposed four years' course in college would but lead to disappointment, as the graduate in it would very likely find himself, when confronted with practical problems, deficient in that broad foundation and thorough grounding that are requisite to cultivate good judgment and business ability. The exactions of a railroad career have a narrowing influence at the best; all the more reason that the foundation of such a one's education should be on a broad and liberal scale, so as to enlarge the mind; so as to give breadth and scope to the intelligence.

The science of railroading may be said to be divided into two great divisions, transportation and traffic. In my judgment the education of a man for these two branches should be somewhat different. It is a rare combination that enables a man to cover the entire field.

Perhaps I can best illustrate my ideas by a practical example. A friend having two sons both destined for the railroad career, sent the boy whose bent was toward the transportation side first to college for two years, where an elementary acquaintance with the classics and literature was acquired. Next he went to one of our old established engineering schools and graduated as a civil engineer. The course marked out for him after that comprised a period of foreign travel, then actual experience in construction work on railroads for two or three years before he will be permitted to enter in the actual service of a railroad company in the transportation department. The other son, beginning in the same manner, but being destined for the traffic or commercial side of railroad life, did not go to an engineering school, but instead entered one of our leading universities and pursued a course especially designed for those intending to follow commercial life—a careful study of law, civil government, finance, political economy, history, etc. After that, with a brief period devoted to study of modern languages, he will be put at work in some subordinate position in the traffic service. I will add that during summer vacations both boys have been obliged to spend a portion, at least, of their time in practical work in the field or in the freight-house or ticket office.

I give you these examples as illustrating in general my idea of what the education of a railroad man will require. To attempt to compress it in a four-years' course after leaving the high school would not, in my judgment, lead to success. The responsibilities of a railroad officer are, in a sense, as great as those of any other profession. The preparation for their proper performance ought to be as careful. I quite agree that one great need of the profession to-day is for better-educated and better-trained men, especially in subordinate positions, and I gladly welcome the discussion of this subject and hope that it may result in much good.

VICE-PRESIDENT.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I wonder whether you are not occupying a mistaken view point in trying to consider railroading as one profession. I wonder if your error does not primarily consist in considering as the ultimate object of such education the qualification of the student for executive position in the railroad service, instead of for some one of the many branches and departments into which the service necessarily subdivides itself. Of the latter positions there are many to be filled, of the former few. While executive employment almost always represents the highest round on the ladder of railroad promotion, and therefore the constant goal of ambition in nearly every branch of the service, all railroad servants realize, first, that the chances of such promotion are exceedingly slim, and, second, that possible promotion within each department presents sufficient incentive to justify their best energies.

I fancy that, whatever may be the ideal situation, the actual trend of the present highly organized service, especially on large systems, is to perhaps increase the interdependence of departments, but by such methods as to bring about a decreasing necessity for knowledge on the part of an officer or employee of one department of affairs and workings of another. What I mean is,

for instance, that there is a decreasing necessity for the engineering department to know anything of accounting methods or for the transportation officers to be expert on maintenance of day matters.

The question to which this leads is whether there would not be much waste motion and lost time in a curriculum that attempted to make the future traffic officer proficient in matters of depot sanitation, or the future auditor in questions of engineering. I admit the incidental broadening of mental scope which goes with all systematic mental effort; but is there sufficient time, and, especially, is their sufficient justification, so far as chances of future employment are concerned, to admit of this?

I notice that one of your correspondents refers to traffic as being unadaptable to being taught in a college course. As a traffic officer I hold the contrary opinion, believing that millions of dollars of revenue would be yearly saved to our railroads if superior and subordinate traffic officers were trained in the underlying principles of their profession by just such a system as would occupy practically the entire time of a post-graduate course. I know that many students of the railroad problem of this country will agree with me that most of that problem is the handiwork of unskilled and untactful traffic officers, and that much of the adverse legislation from which our railroads suffer to-day is chargeable to them. The education that begins on the way-bill desk has proven woefully inadequate in many cases to produce officers to whom it is safe to entrust the care of the earnings of millions of dollars, the commercial relations between those millions, in the form of railroads, and the public, and, indirectly, the shaping of the course and scope of American commerce.

I fancy your university course as contemplated in your editorials is like the bundle of fagots in the old fable—it must be taken up a twig at a time to be broken—not as a whole. I think there is room, not for a course in railroading, but for several courses in railroading; largely co-ordinated, but largely distinct.

D. A.

Test of the Performance of a Locomotive Injector.

We are permitted to give to engineering readers a detailed description of the apparatus, the methods employed and some of the results that were obtained in a recent comparative test of locomotive injectors. This test was made by a disinterested company, with apparatus that can be duplicated with the material at hand in almost any railroad shop, and the system described will give accurate results with but little trouble and preparation. If the methods described in the following article are repeated, it is believed that no difficulty will be experienced in obtaining satisfactory and decisive results at a small expenditure. The injector used in the test was a No. 10½ of the improved form of the Sellers 1887 pattern; it was chosen in common with several other well-known injectors for the purpose of making a selection for the equipment of a large number of locomotives, and to ascertain if the performance at certain given steam pressures fulfilled the requirements of the specifications.

Apparatus.—The injector was supplied with dry steam from a 200 H. P. Babcock & Wilcox boiler carried from the junction valve through a 3-in. pipe carefully lagged with asbestos covering. The injector was bolted against the side wall of the boiler with the starting lever and water supply valve within convenient reach of the operator. The water supply was maintained at a constant level in a large barrel directly below the injector, into which the suction pipe was extended to within one foot of the bottom; this pipe was 2½ in. diameter up to the nipple of the injector, where it was reduced to 2 in.

As the delivery of the injector was too great to be taken into the boiler without affecting the steam pressure carried, it was passed through a special balanced valve (Fig. 3) which maintained a constant pressure equal to that of the boiler. The delivery pipe of the injector was coupled to the under side of a check valve, which was connected to a piston of the same area, upon the upper side of which full boiler pressure was obtained by a pipe tapped into the steam supply. Gages were placed so that the pressure in the steam pipe or in the delivery pipe could be obtained alternately on either or both gages, or simultaneously on separate gages; this arrangement worked very satisfactorily, and the admission of any error due to the difference between the steam and delivery pressures, or to a discrepancy between the two gages, could be prevented. Fig. 2 shows the arrangement of pipes, valves and gages by which this was accomplished, and is self-explanatory.

The water supply was weighed and delivered into the suction barrel as follows: Ten feet above the level of the suction barrel were two large tanks, forming a reservoir capable of holding about 1,100 gals. From the 3½-in. flanged pipe bolted to the bottom of each was a vertical 3-in. pipe, extending into the suction barrel, 6 in. below the 4-ft. level; this pipe was made amply large, so that under the head available the tanks would be drained and the pipe emptied before the level of the water in the barrel could be lowered by the injector more than 6 in.; owing to the slope of the bottom of the tanks and the large size of the emptying pipe, this was accomplished without the slightest trouble. A gate valve was placed in this pipe close to the injector, so that the proper level of the water in the suction barrel could be maintained by the operator.

Above and resting on these water tanks was a 500-lb. platform scale carrying a 47-gal. barrel, into the bottom

of which was screwed a 2-in. outlet pipe for emptying it quickly into the iron tanks below; this pipe was kept clear of the sides of the tank and the scale. Another pipe brought the water supply from the city mains above the top of the barrel and as it was supplied with a quick-acting tight gate valve the barrel could be quickly weighed empty, filled, reweighed and emptied into the iron tanks until the quantity of water required for a run of from 15 to 20 minutes was obtained.

Another means for supplying the barrel with water during the preliminary run before each experiment was found to be necessary, because when the reservoir was filled with weighed water, none could be withdrawn until the moment the experiment commenced. For this purpose a 2-in. hose was run into the barrel and a valve placed near the discharge end, and the water level maintained constant until all preparations were completed;

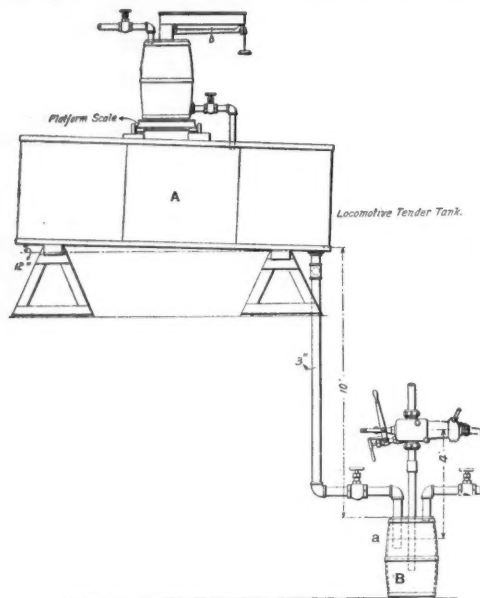


Fig. 1.—Test of a Locomotive Injector.

this valve was closed and hose withdrawn before the valve for the reservoir tanks was opened.

Measuring Devices.—The steam gages had been subjected to careful test and calibration by the makers; at the same pressures the readings of the two gages agreed exactly.

The thermometers were tested in oil every five degrees, both up and down, and the corrections noted, from which a table was made and used to obtain actual temperatures. The delivery thermometer was brass cased, and was screwed into the delivery pipe close to the injector, with the bulb well immersed in the passing water; the scale was divided to single degrees, and could be read easily to half degrees. It was corrected for the error due to the compression of the bulb as it was subjected to the pressure of the delivery.

The scale used for weighing the feed water was tested by United States standard weights and found to be correct. The barrel resting upon the scale platform was weighed before and after each filling, so that the exact net weight of water passing into the receiving tanks each time could be determined.

The filling of the water-tank reservoir required two observers, one to open and close the inlet valve from the city mains and the valve from the bottom of barrel leading into the reservoir, and a second to shift the tare weight for the empty and the full barrel, and to record the weights upon suitably prepared blanks. As the scale registered to $\frac{1}{4}$ lb., the possible error was very small, for a test by United States standard 100-lb. weights after the experiment was completed showed no change.

Method of Testing.—The reservoir tank having been filled with the required weight of water, the valves in the steam pipe were opened wide, and the water drained out; the water regulating valve on the injector was opened and the cam lever over the waste valve was set so as to allow this valve to open freely. Precaution was taken to insure the water supply being free from dirt and chips and the suction barrel clean. The 2-in. hose from the water main was led into the barrel and the injector started against full back pressure. The hose discharged beneath the surface of the water to prevent air being carried down into the water and interfering with the free flow in the suction pipe. Observations were made as to the regularity of the steam pressure, and the readings of the steam gages and the thermometers in the suction barrel and delivery pipe were found to be practically constant; an observer was stationed at the water valve in the 3-in. pipe leading from the overhead reservoirs, another to read the gages and thermometers, and a third to take and record all readings and note the general performance of the injector. When everything was ready, the barrel was rapidly filled through the hose and then its valve closed and the hose entirely withdrawn; as soon as the water level in the barrel was drawn down by the injector to the lower white line (B), (see Fig. 2) the recorder noted the exact time on a stop watch, the other observers noted the thermometer and gage readings, while the valve in the 3-in. feed-pipe from the reservoirs

was quickly opened and the water level raised to the line (A) four feet below the center of the injector, where it was maintained during the continuation of the experiment by careful regulation of the valve. Readings of the thermometers and the gages were taken every three minutes until the reservoir was empty, which could be immediately noted by the rapid falling of the level of the water in the barrel; just before the lower level was reached the end of the 3-inch pipe from the reservoir was exposed, this construction being insisted upon so that the observer could be certain that all the water in the reservoir had flowed into the barrel; when the lower level—from which the start was made—was reached the signal was given to the recorder, and the time again noted, the difference in time being that required to lift and force against initial pressure the total weight of water contained in the reservoir; from this could be calculated the capacity of the injector in pounds, cubic feet or gallons per hour.

The method of determining the minimum was the same, except that occasional adjustment of the regulating valve was required during the experiment owing to variations in the pressure of the steam; also, the quantity of water weighed into the reservoir was less than half that used for determining the maximum. Care was taken that the counter pressure produced by the back pressure valve should always be equal to that of the boiler so as to obtain precise results.

From those two sets of experiments were determined the figures for the ratio of the minimum capacity to the maximum; subtracting this from 100 gives the "range" in percentage of maximum.

To determine the relation between the weights of the supply water and of the steam required to force it into the boiler, it is evident that the simplest method would be to subtract the known weight of the supply from the weight of the delivered water and then divide the weight of the supply by this difference. With small injectors this is often done, as the volume of water to be handled is not large, but with an instrument of the size used this method becomes impracticable. The method of delivery temperature was therefore substituted and the same results obtained without the necessity for weighing the delivery. The formula used was the following:

$$W = \frac{H + 32 - (.003) P - T}{T - t + (.003) P}$$

W = Weight of water delivered per pound of steam.

H = Total heat in one pound of steam (absolute pressure) above 32 deg. taken from steam tables.

T = Temperature of the delivered water.

t = Temperature of the water supply.

P = Steam pressure (gage).

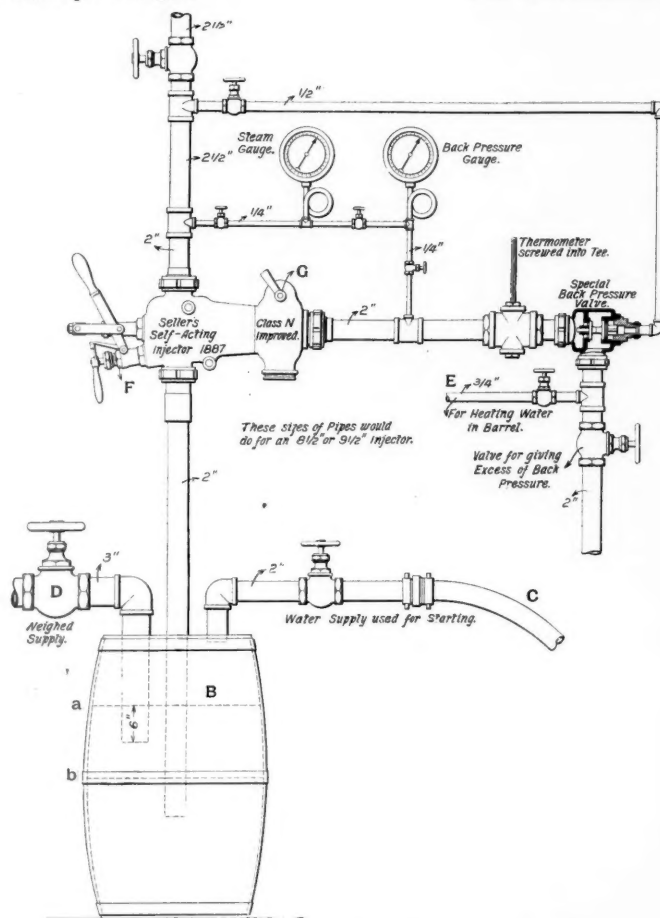


Fig. 2.—Test of the Performance of a Locomotive Injector.

Maximum water supply temperatures were obtained by returning some of the water from the delivery pipe to the barrel or reservoir; care was taken that the hot and cold water should be thoroughly mixed and that the temperature should not be increased too rapidly. Two sets of results are given: limiting temperatures at each steam pressure for automatic re-starting without subsequent waste of hot water or steam from the overflow; also maximum operating temperature at which the injector will run without the jet breaking;

the former were obtained with the waste valve free to rise on its seat; the latter, with the waste valve closed by throwing the cam lever backward; in this case if the jet breaks, steam will flow back into the suction pipe until the waste valve is allowed to open or the steam supply is shut off.

Numerous special tests were also made to determine the action of the injector under conditions frequently occurring in practice, such as variations of the steam pressure, hot water in suction pipe, and the effect of a

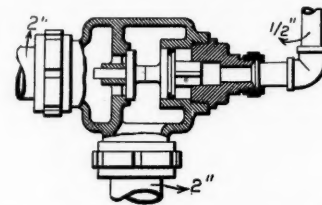


Fig. 3.—Special Balanced Valve—Locomotive Injector Test.

temporary interruption of the water supply, such as would occur when the movement of the water in the tank of a locomotive uncovered the end of the suction feed pipe; also, the amount of water wasted during starting and stopping. An account of these tests will be made under the heading of "Results."

It should be noted that all the experiments were made without throttling the steam supply; this was found to be necessary as an early experiment at 150 lbs. steam showed that the superheating due to wire drawing materially affected the results; in all subsequent tests the pressure of the boiler was raised or lowered to meet the requirements of the experiment.

The directions given in the catalogue of the manufacturers for stopping and starting the injector were followed: To start: Pull out the lever. To stop: Push in the lever. Regulate for quantity with water valve. In starting on high lifts and in lifting hot water, it is best to pull the lever slowly.

Results.—To facilitate the comparison, the performance of the injector at different pressures and the results obtained at each set of experiments have been plotted in separate diagrams, forming curved or broken lines connecting the several observations, so that the results for any intermediate condition can be easily determined; as the scale of the diagrams is necessarily small, a complete table of results has been given, which contains the actual figures obtained. The results of the tests were remarkably good, for in several cases, the claims of the manufacturers were much exceeded. Accompanying each diagram is a short review of the results.

As stated above, however certain tests were made which could not be tabulated, but are almost equally valuable in considering the general performance of a locomotive boiler feeder.

(A) Variation in steam pressure. The injector was started with the lever starting valve and the water regulating valve wide open, and the pressure in the boiler and the back pressure were simultaneously lowered from 200 lbs. to 120 lbs., and then later, with all valves as before, from 120 lbs. to 40 lbs. steam, without a drop of water appearing at the overflow; raising the steam pressure caused no overflow of steam or water at the waste pipe, and the injector seemed to operate as successfully at one pressure as another, without making change in the tubes or in the position of its steam or water valves.

(B) From the fact that this injector worked very satisfactorily with hot supply water, it was evident that its lifting power with the suction pipe warm would also be good; owing to the provision of large overflows in the forcing combining tube, it is not necessary that care should be used in admitting steam to the main jet after

priming—as is the case with other forms of injectors—for even though the feed water be above the limiting temperature as it comes from the lifting nozzle, the forcing jet will not break, but will cause an overflow of steam and hot water until the hot water is drawn out; which usually occurs in a few seconds; in this case the amount of waste was small, but with cold water only a few drops appeared at the waste nozzle at 60, 120, 200 lbs. of steam or intermediate pressures. The mean of a number of tests, stopping and starting the injector with the

supply water at ordinary temperatures, gave one-half pint as the amount wasted each time.

(C) It has been found by the experimenters that the admission of air to the suction pipe of all injectors which adjust their capacity to suit variations in the steam pressure is to immediately break the jet, and to cause the steam to blow back through the hose into the tank; but with this instrument any such interfer-

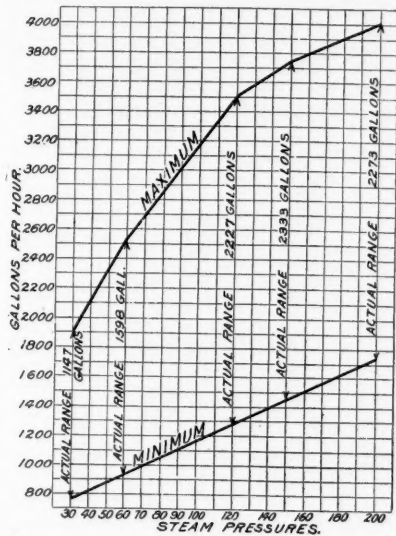


Diagram No. 1.

ence with the normal condition of the jet causes a waste of steam or water at the overflow pipe, which cease as soon as the disturbing cause is removed. To test this feature, the water in the suction barrel was allowed to fall below the lower end of the suction pipe, so that air would be sucked up into the injector. This caused a discharge of steam and air from the waste pipe, which ceased as soon as the usual level of the water in the barrel was restored. This test was repeated at 200 lbs. steam pressure, when the lifting of the supply water and the forcing it into the boiler occurred the instant the water covered the end of the suction pipe.

In regard to the injector itself, it may be said that it responded promptly at all times to the movement of the starting valve. It is started and stopped by the continuous motion of a single lever, and was regulated by a side motion of the quadrant regulating lever only for the purpose of altering the amount of delivery. Its construction is simple and easily understood; no outside rods, levers or bell-cranks are used, nor complicated internal valves. When hot water is to be lifted it was found that the strongest suction was obtained when the starting lever was drawn forward about 1 in. and the remainder of the stroke given after water appeared at the waste pipe.

The Diagrams.—Diagram No. 1 is a graphical representation of the capacity tests given in lines 1 and 5 of the Table of Results. At the top, ranging from left to right, are gage pressures in pounds per square inch, from 30 to 200 lbs.; the horizontal lines indicate gallons of water taken from the supply tank per hour, so that the heavy curved line shows the change in the capacity with the steam pressure. The maximum capacity increases as the pressure rises from 1,912 gals. at 30 lbs. to 3,585 at 60 lbs., then 3,510 at 120, 3,760 at 150 and 4,000 at 200 lbs. steam; the last capacity is higher than that

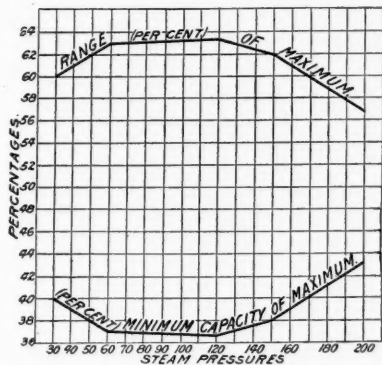


Diagram No. 2.

at any lower steam pressure, and is above that of any other injector of the same size, even though the capacity may be the same at 120 or 150 lbs. The minimum is shown by the lower heavy line of the diagram, and increases from 765 gals. at 30 lbs. to 1,732 at 200 lbs. steam; this possible reduction of the capacity at 200 lbs., from 4,005 gals. to 1,732, is such a great variation in the amount of water delivered that it is very evident that the injector can be used to feed the boiler continuously with either a light or heavy train.

The ratios between the maximum and the minimum are given by the heavy line in the lower part of Diagram No. 2, and the range in percentages is given in the upper part. These same values are given in lines 8 and 10 of the table.

Upon the figures obtained during the test to determine the maximum capacity are based the values given in Diagram No. 3 and in line 4 of table, which show the weight of water taken from the supply tank per pound of steam used by the injector. This represents the actual amount of mechanical work done by the steam, and is a point of special value to practical men; it is a good gauge of the efficiency of the design of the injector and of its economy as a boiler feeder, as it indicates that the minimum amount of steam is used to perform the work of feeding, and no excess is condensed and utilized only for heating the feed water. Under the same conditions of supply temperature and lift, the weight of water delivered per pound of steam must always decrease as the pressure rises.

A critical comparison of the results obtained on this experiment proves the superior design of this pattern. Referring to the actual figures of diagram No. 3 or the table, it is seen that at 120 lbs. steam, 13.6 lbs. of water are taken from the tank and forced into the boiler by 1 lb. of steam, and at 200 lbs., 10.34 lbs., the latter result being especially remarkable.

It is very seldom necessary that a locomotive injector is required to feed when the temperature of the supply exceeds 100 deg., but when the occasion demands, the action should be certain and permit a fair range of capacities. Many injectors will not operate at the higher pressures with the supply at this temperature, consequently their action when starting with hot feed pipes causes a very large amount of overflow before the jet enters the boiler. Several temperature tests were made at 30, 60, 120 lbs. steam, etc., and the results are given in diagram No. 4 and lines 11 and 12 of table. The limiting temperature at which the injector is re-started at various steam pressures is given by the lower line, and the maximum temperature to which the supply may be raised before the injector ceases to operate is shown by line B. The vertical lines of the diagram indicate steam pressures as before and the horizontal lines degrees Fahrenheit. Starting at 30 lbs. steam, the limiting temperature is 138 degs. which rises to 143 degs. at 60 lbs.; at 120 it is 137 deg., and at 150 lbs. pressure 133 degs. These were obtained with the waste valve closed

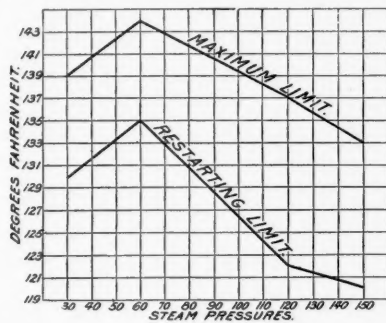


Diagram No. 4.

to prevent the waste which would occur as these limiting temperatures were approached.

The following is the condensed table of results:

TABLE OF RESULTS OF A TEST OF A SELLERS' IMPROVED INJECTOR OF 1887, SIZE 10 1/4.
Lift 4 ft.—Supply Water Weighed.
Maximum Capacity.

Mean steam pressure.	30	60	122	151	200.5
1. Gallons of water per hour.....	1,912	2,535	3,517	3,765	4,005
2. Temperature of supply water.....	67.0	67.0	54.0	50.0	50.5
3. Temperature of delivered water.....	113.25	125.0	133.4	135.7	154.0
4. Weight of water delivered per pound of steam used.....	25.90	19.10	13.60	12.60	10.34

Minimum Capacity.

Mean steam pressure.	30	60	120	148	200.6
5. Gallons of water per hour.....	765	987	1,290	1,432	1,732
6. Temperature of supply water.....	67.0	67.0	54.5	55.0	50.0
7. Temperature of delivered water.....	171	212	238	250	263

Range.

Mean steam pressure.	30	60	121	149.5	200.5
8. Per cent. min. cap. of max.....	40.0	37.0	38.6	38.0	43.2
9. Actual range in gallons per hour.....	1,147	1,598	2,227	2,333	2,273
10. Per cent. range of Max. capacity.....	60.0	63.0	63.3	62.0	56.8

Limiting Temperatures of Water Supply.

Mean steam pressure.	30	60	120	150
11. Limiting re-starting temperature.....	130°	135°	122°	120°
12. Limiting operating temperature.....	139°	144°	137°	133°

In conclusion it may be stated that the greatest care was taken to prevent the possibility of error in observation or in accuracy of apparatus. The operators were

all skilled in experimental work and the observation and calculation of each were carefully checked. The injector was taken directly from stock and without special preparation, and in performance it exceeded in every detail the requirement of the specification.

American Society of Mechanical Engineers.

Last week we gave an abstract of the President's address and also briefly the proceedings of the first session of the semi-annual meeting of the American Society of Mechanical Engineers, including the report of the Council. The discussions of the papers which were presented at the meeting are very interesting, and the papers themselves cover large range of subjects and contain much valuable information. It is our purpose to give the main points of nearly all of the papers, which were read at the meeting and to note some of the discussions which followed their presentation.

Wednesday Morning.

We referred last week to the lively discussion which followed the reading of Sir Henry Bessemer's paper on the "Historical and Technical Sketch of the Origin of the Bessemer Process." As we shall refer to the paper itself in a later issue, we reserve publishing an abstract of it at this time.

A paper by W. T. Bonner on "Ancient Pompeian Boilers" was interesting as a matter of history. He called attention to the fact that boilers in use in Pompeii were designed to be used only for heating water and not for steam under pressure. It is interesting to consider the artistic turn of mind which lead them to ornament every detail of the article under construction. One of the noteworthy features of one of these old boilers is that there are no joints in the sides of the cylinders, and it may be supposed that the cylinders were cast and then worked or turned to an even thickness throughout.

"Methods of Determining the Work Done Daily by a Refrigerating Plant and Its Cost" was the subject of a paper presented by Francis H. Boyer. The test was made on the refrigerating plant in the Abattoir of John B. Squire & Co., East Cambridge, Mass., which was installed by the De La Vergne Refrigerating Machine Co. A table is presented showing a method whereby the cost and output per day are easily reckoned. As a result of careful computation for 1894 the average cost per ton for refrigeration was found to be 58.7 cents. The following figures may also be of interest: For January of that year, 1,860 tons of ice were produced in the plant at a cost per ton of 85 cents; in April, 2,821 tons were made at a cost of 73 cents per ton; in July, 6,736 tons at 31 cents per ton, and in October of the same year 5,419 tons were produced at a cost of 52 cents per ton.

Professor Thurston's paper on "The Promise and Potency of High-Pressure Steam" contained the results of 18 trials, made on a triple-expansion engine which has recently been placed in the experimental laboratory of Sibley College, Cornell University. The cylinders of this engine are 9, 16 and 24 in. in diameter and the stroke of the piston is 36 in. It would be impossible to give the results of these tests in a few words, and those interested will find the experimental data in full in this paper. We give the results of but one where steam under a very high pressure was worked in the cylinder. In the sixteenth trial 500 lbs. pressure was used. The average for one mile in smooth running gave 16.08 D. H. P. at 10.54 lbs. of steam consumed per horse-power per hour. The indicated horse-power was 17.3 and the engine demanded 9.75 lbs. of steam per horse-power per hour. The

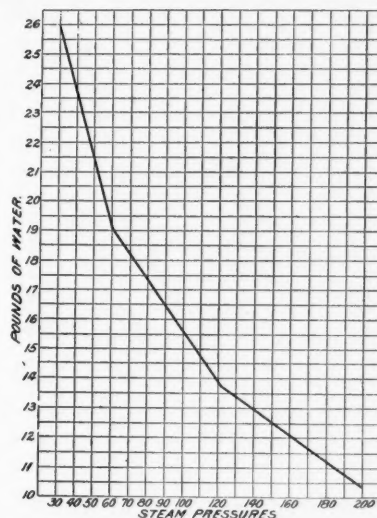


Diagram No. 3.

friction fell at this comparatively high power to 6.5 per cent. Some of the results obtained from the tests are plotted graphically, and while they show interesting results we do not find that any conclusions were drawn.

Thursday Morning.

The first paper read at the morning session was by F. R. Jones and L. A. Goodard on "Experimental Investigations of the Cutting of Bevel Gears with Rotary Cutters." The authors explain in detail the operations employed in cutting bevel gears with rotary cutters in a milling or steam machine, and then state that a study of the problem led to the supposition that the amount of

a gear must be revolved to be expressed in terms of the pitch, the co-efficient being a variable depending upon the center angle of the gear which they took as the angle between the element of the pitch cone and the axis of the gear. It was also thought that this angle through which the gear must be revolved must be independent of the pitch of the gear. Then follows an explanation of the methods employed by them to determine the proper setting for gears of different center angles.

Mr. John W. Seaver's paper on "A Two-Hundred-Foot Gantry Crane" was listened to with much interest. The crane is now being made for the Cambria Iron Co. of Johnstown, Pa. The yard for which it was designed is 400 ft. wide x 800 ft. long, and the problem which confronted the engineers was a serious one. Several methods for covering the area were proposed. First it was designed to use stationary derricks with swinging jibs. This, while probably the cheapest construction, was probably the most objectionable on account of the large number of derricks required to cover the surface, thus using much available space. The next plan was by means of a system of surface tracks between which the material to be stored could be piled, and on these tracks a number of locomotive cranes could be placed. The same objections which were made against the derricks were also made against the second plan, and besides the locomotive cranes would be very expensive, and their range of length of jib is quite limited. A third form of construction, and one that seemed to offer several advantages over the other two plans, consisted in a series of overhead tracks running parallel to the length of the yard, and mounted on these tracks were to be a number of overhead traveling cranes of ordinary type. This plan was discarded on account of the expense and the space which would be required by the supports.

We illustrate by the accompanying drawing the 200-ft. gantry crane which was finally adopted. There are two of these now being constructed which run upon tracks on the surface of the ground parallel to the length of the yard, so that the two cranes cover the whole surface. A clear height from the surface of the ground to the under side of the crane of over 21 ft. is obtained. The construction is peculiar in some respects, but it has an advantage of giving great strength. The live load is taken directly from the stringer suspenders up to the top of the posts of the main trusses by means of diagonal suspender angles in order to prevent any cross-strains of the struts resulting from the live load. To still further provide for any sudden complication of a live load it was designed so that 22,000 lbs. might be applied at any panel point of the bottom chord of any truss. The dead load weight of trusses and floor was assumed at 88,000 lbs. per truss, or 8,000 lbs. at every point of the bottom chord of each truss. The crane rests upon four tracks of 3 ft. 6 in. between the centers of rails.

The minimum speeds of the various motors of the crane are as follows: Speed of main bridge, 200 ft. per minute; speed of trolley bridge, 400 ft. per minute; hoist with full load, 20 ft. per minute.

"Contraction and Deformation of Iron Castings in Cooling from the Fluid to the Solid State" was then read by Francis Schumann. The results given in this paper were the outcome of 12 years of observation and research and the nature of the treatment of the subject can best be inferred by giving in full his conclusions, which are as follows:

The deformation of prisms due to unequal contraction can be overcome by providing counter deformation in the pattern, or by the addition of auxiliary parts that can be readily removed from the casting. Generally, the section should be so subdivided or designed that the ratio R , of the cooling surface to the area of the prism is alike around the center of gravity of the section.

In complex machinery castings the design should be so modified or chosen that these will result in the least differences in the rate of cooling, or ratios R of the different members. Sudden changes in form cause severe initial stresses, if not fracture, and should be rigidly avoided.

Imperfectly proportioned flanges, ribs, or gussets added to the main body of a casting, for either the purpose of increasing the strength or connections, may be sources of weakness.

Hollow cylindrical columns, although cast of even thickness and left in the mould until cold, may become crooked by reason of the unequal rate of cooling between the upper and lower halves, due to the currents of air passing through the column and clinging to the under side of the upper half after the core arbor is removed, which is usually done shortly after pouring, and while the casting is still red-hot. This deformation is avoided by stopping the ends with sand immediately after the withdrawal of the core.

Greater attention to the laws of cooling and correct forms and proportions of castings will result in increased strength and economy, besides the avoidance of annoying crooked castings and mysterious breakdowns.

In the discussion which followed this paper, one of the members stated that he had found as the result of careful investigation that in pulling iron castings from

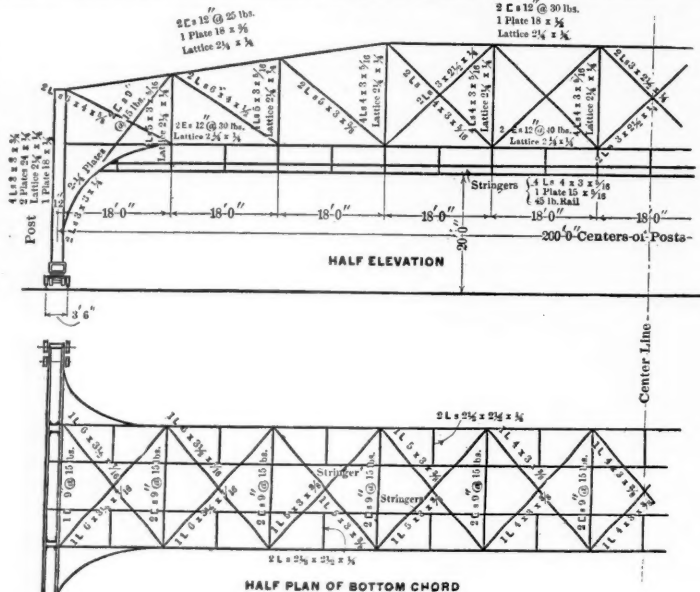
white to red heat an expansion took place, and from red heat until the iron was cold a very large contraction occurred. The question was raised by the author of the paper if it was possible to determine the shrinkage and expansion on a scientific basis. Messrs. Gus Henning and William Kent spoke of different phases of the subject from both a practical and theoretical standpoint.

Below is given an abstract of J. V. Shaefer's paper on the "Washing of Bituminous Coal by the Luhrig Process."

The perfection of the Luhrig system of coal washing was the life work of Mr. Luhrig among some of the most difficult coals of Europe. This system, after being perfected in Germany, was introduced into England and Scotland by the Messrs. Merry & Cuninghame at their collieries. It is now almost exclusively used in Great Britain. Messrs. Cuninghame & Co., controlling the Luhrig patents in the United States and Canada, have introduced the system into this country, and have built successful Luhrig washeries at Cartersville and DeSoto, Ill.; Belt, Mont., and Union Bay, Vancouver Island. A 600-ton plant for coking coal is now building at Greensburg, Pa., for the Alexandria Coal Co.'s Crabtree mine, of which the following is a description:

A 500-ton storage bin already in place is used for a "raw-coal" storage bin. From this bin the unwashed coal, crushed to the size of nut coal and under, flows into an elevator, which takes the raw coal to the top of the washery. This elevator delivers to a tripple-jacketed screen, which is 15 ft. long by 8 ft. diameter and grades all the coal into four sizes, Nos. 1, 2 and 3 nut, and fine coal. On the third floor of the building are six nut-coal jigs, two for each of the three sizes of nut coal. These jigs are so adjusted that only the very clean nut coal goes over as coal, and is sluiced to a draining screen. This screen has three 8-in. openings; it thoroughly drains the coal, and delivers it into another elevator. This elevator runs slowly, and has perforated buckets so as to further drain off the water and deliver the coal into the washed coal storage bins as dry as possible.

All material going into the nut-coal jigs that does not flow out as clean coal passes out on a lower level as refuse, and is automatically collected by a screw conveyor, and delivered to a perforated bucket elevator, which lifts it out of the water and delivers it to a crusher. The product from this crusher is raised by an elevator to a screen, where it is again graded, and then re-washed in two



A 200-ft. Gantry Crane.

For description see abstract of paper by J. W. Seaver, of A. S. M. E., printed in this issue.

special feldspar rewashing jigs. The cleaned coal from these rewashing jigs flows into a perforated-bucket elevator, where it is drained, and falls into bin to be used as fuel.

The great advantage, in a washery for coking coal, in washing the nut coal before crushing is that all impurities intergrown with the coal in the nut-coal sizes are at once taken out of the coking coal, cleaned and used for other purposes. If these pieces were crushed before washing, their impurities would be mixed with the clean coal and no amount of subsequent washing would get them all out again. If it is desired to reduce all the coal to a fine state before coking, it is better to wash first, and then disintegrate the clean nut coals after washing.

Over 200 plants are in daily use in England, Germany, Austria and other parts of the world, all doing good work. Several of these plants have capacities of 175 tons per hour each.

The deformation of prisms due to unequal contraction can be overcome by providing counter deformation in the pattern, or by the addition of auxiliary parts that can be readily removed from the casting. Generally, the section should be so subdivided or designed that the ratios of the cooling surface to the area of the prism called R are alike around the center of gravity of the section.

In complex machinery castings the design should be so modified or chosen that these will result in the least differences in the rate of cooling, or ratios R of the different members. Sudden changes in form cause severe initial stresses, if not fracture, and should be rigidly avoided.

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The paper on "Friction Horse Power in Factories" was then taken up, and its author, Prof. C. H. Benjamain, gave in conclusion the following rules, which, if followed, might effect a saving which would be noticeable in the annual balance:

1. Use pulleys of large diameter on counters and narrow fast-running belts.
2. Use nothing but the best oil and plenty of it, catching all drip, and either purifying it or using it for some other purpose.
3. Have all the shafting and counters oiled regularly, and do not depend too much on automatic oiling.
4. Inspect line shafts from time to time, and see that they are in line and can be turned easily. Many line-shaft boxes bind at the sides when screwed down, sometimes increasing the turning moment 100 per cent.

Thursday Evening.

"Some Special Forms of Computers" was treated by F. A. Halsey, and the results showed the advantage of the instrument over arithmetical computation in that it placed before the eye at once all possible solutions of the problem. The paper dwelt for the most part on the Cox instrument which was illustrated and the method of its working described.

Mr. N. P. Wood presented the fourth paper of the series on "Rustless Coatings for Iron and Steel," and spoke of the dangers of using the oxide of iron in any form for the protection of metallic structures from corrosion, and gave an explanation of the causes and extent of such corrosion.

A paper which could hardly be called scientific in its nature, and yet extremely practical in its treatment, was then read by H. M. Lane on "A Method to Determine the Selling Price." Mr. Lane's object in presenting the balance sheet which accompanied the paper was to show how a large manufacturing concern might obtain in a simple manner the result of the business transactions at the end of each month or week.

The session was concluded by an illustrated presentation of "The Report of Progress Upon the Tests of Fire-proofing Material," by Mr. H. deB. Parsons. This report was published in full in the *Railroad Gazette* of Aug. 7 of the current year.

Friday Morning.

The reported tests given in the paper by Prof. W. F. M. Goss on "Paper Friction Wheels," showed results which were highly satisfactory. Professor Goss called attention to the well-known fact that the amount of power that can be transmitted by friction gearing depends upon the characteristics of the material used with the two wheels which run in contact. As usually constructed, the driver is made of yielding material, while the driven wheel is almost invariably of cast iron. Such combinations have the advantage of producing a high co-efficient of friction between the wheels, and if there is any slipping it is the harder wheel that stops, and upon this the continuous motion of a softer driver inflicts no damage. The paper wheels which he tested were composed of thin disks of straw board cemented together under heavy pressure, and strengthened by iron side plates or fitted over iron centers. In this manner, the face of the wheel presents the edges of the straw board disks, and these give a surface which finish well and work smoothly in rolling contact with cast iron. Briefly, the summary is as follows: First, by increasing the load to be carried, the slippage may always be gradually increased to three per cent., and under favorable conditions may reach a maximum of six per cent. Second, the co-efficient of friction increases with the increase of the slip until the latter becomes about three per cent., after which the action of the gearing becomes uncertain. Third, with a constant co-efficient of friction the power transmitted varies directly with the pressure of contact. Professor Goss concludes his paper by giving a table showing the horsepower which may be transmitted by means of a clean paper friction wheel.

"Steam-Engine Governors" was treated historically and theoretically by Frank H. Ball. The questions of centrifugal force and angular acceleration in relation to the action of governors was discussed at some length, and his general conclusions are as follows:

First. Centrifugal force is the most important governing force, because it is indispensable.

Second. Angular accelerating force is next in importance, because it is an unqualified help as an actuating force, and its practical usefulness is limited only by constructional considerations.

Third. Tangential accelerating force is of questionable utility, because of the disturbing forces that it is almost sure to put into operation.

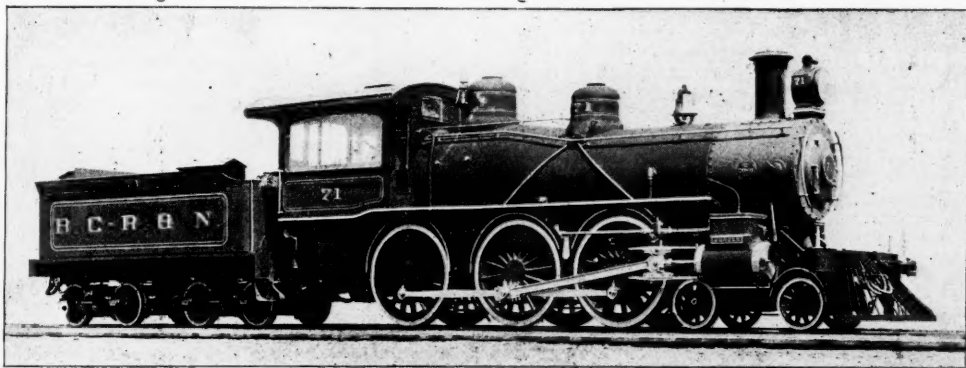
The longest paper which was presented at the meeting was on the subject of "The Metric versus the Duodecimal System," by George W. Colles, Jr. This is probably the only lengthy attack on the metric system which has been published for 10 years. Mr. Colles takes up the subject historically and shows the attempt to introduce the metric system in Great Britain, the United States and other countries. He then dwells upon the subject from a scientific and from a commercial standpoint and sums up his arguments in 21 conclusions. He questioned if Congress has the right to compel legal enactment of the use of any system; that if it was something that would prove of service to Americans its universal use would come through other means than by forced legislation. In the course of the paper he showed that the population of the countries using the metric system was about \$279,735,000, and those using the non-metric units was 911,040,000, while the commerce of the United States in 1895, with the countries using the metric system amounted to \$664,436,000, and with the countries using the non-metric system it was \$869,127,000. In other words, he states that our trade with British possessions

alone is greater than that with all other metric countries combined.

In the discussion following the presentation of this paper the opinion was expressed that while the metric system may have advantages over our present system, its adoption would lead to great trouble in the manufacturing world, and result in the loss of millions of dollars. Objections were made by some of the members present to certain statements in the paper, and especially to the manner of presenting the conclusions. It seems as if some of these conclusions have no scientific weight whatever and were drawn not from the arguments presented, but from a personal dislike to the metric system. It is to be hoped that the author of the paper will adopt some of the suggestions which were made at the meeting and so modify it, and if necessary correct any parts that may be at variance with the facts, so that when it falls into the hands of those who are interested in the legislative enactment of compulsory laws, the arguments may appeal to them on the merits of the case and be entirely free of any biased opinion of its author.

The concluding paper was by Leonard Waldo on "Aluminum Bronze Seamless Tubing." He stated that we have the following observed facts indicating a chemical combination between the copper and aluminum in aluminum bronze:

1. Under favoring conditions well-developed crystals, showing fixity of chemical composition and perfect regularity of form, are found in ingot metal.
2. Evidence of intense chemical action takes place on adding molten aluminum to molten copper. The evolution of heat causes the mass to rise to whiteness with free evolution of gases.
3. The molecular volume of the resultant mass is less than the theoretical volume. The specific gravity and electrical conductivity are different from values based on the assumption that the aluminum and copper are merely mixed together.



Passenger Locomotive for the Burlington, Cedar Rapids & Northern.

Build by the BROOKS LOCOMOTIVE WORKS, Dunkirk, N. Y.

4. The color of the compounds corresponding to the formulae Cu_3Al and Cu_2Al closely approximate each other and a true gold color; while the color of Cu_3Al is distinctly greenish and resembles brass.

5. The compound resists chemical action to which one of its components will sometimes yield.

6. In remelting the compound, both the copper and the aluminum give evidences of oxidation, although, if the aluminum existed in the free state, the aluminum only should oxidize, and the copper should be protected by the action of the aluminum.

7. When aluminum bronze is in a mass and the various parts are examined by chemical analysis and optically with the microscope, it is found that every part of the solid mass is identical in its chemical composition, and at no point is there any appearance of liquation or any free aluminum. In making this experiment it is necessary that the bronze be so made as to insure a perfect fusion of its components in its preparation.

8. Unlike ordinary copper alloys, aluminum bronze preserves its identity up to its melting point. It does not become red short, but it can be forged to a knife edge at a bright red heat, and at this temperature shows no tendency to "sweat" its aluminum or to otherwise change its chemical relations. The melting points of those compounds corresponding to Cu_3Al and Cu_2Al are nearly identical (1,030 degrees Cent. = 1,886 degrees Fahr., Le Verrier).

9. There are no allotropic forms known of aluminum. It acts feebly as a base, but in many known cases plays the part of an acid radicle, forming with other metals, such as iron, magnesium, etc., a series of aluminates. The valency of the aluminum here is in doubt. In the case of the compound Al_2Cl_3 and its class, aluminum is probably a tetrad. In the case of aluminum methide $Al(CH_3)_3$, it seems to be a triad. The valency of copper is also in doubt. It is probably a dyad. It is believed to have the property in certain cases of becoming a negative acid radicle, and at least four oxides are known. The chemistry of the copper, oxygen and aluminum elements, not including the occluded gases which are set free at the melting temperatures, thus becomes highly complicated, and the exact reactions taking place must vary with varying crucible charges and furnace treatment. Most probably there will be found to be a series of compounds of aluminum and copper, and these compounds may exist in such numbers that we may find for practical purposes that aluminum combines with copper in all atomic proportions.

Mr. Waldo then spoke of the production of seamless tubes, and stated that it had long been evident that aluminum bronze was an ideal metal for drawn tubes, but serious difficulties presented themselves from every stage of production from the ingot down. Experiments have shown that aluminum bronze was not to be economically worked or even worked at all with many grades on draw benches originally planned for copper or brass, and the hardness and high tensile strength combined were found to be destructive to these metal dies used in the best hydraulic benches. He then referred to the process of making solid aluminum bronze ingots known as the Mannesmann process, as outlined in detail in the transactions of the American Institute of Mining Engineers, Vol. XIX., for 1891. The method adopted for annealing tubes was illustrated, and the paper concludes with tables giving the results of tests of the tubes at low and high temperatures, cold drawn and annealed.

The summer meeting of the society will be held at Hartford in May, 1897.

Ten-Wheel Passenger Locomotive for the Burlington, Cedar Rapids & Northern.

We illustrate this week one of three 10-wheel passenger locomotives recently furnished the Burlington, Cedar Rapids & Northern by the Brooks Locomotive Works. The running plates of these locomotives are of steel. The Leach sander is used. The tender tank has the capacity of 4,000 gallons. The feed water is supplied by two Monitor injectors. The engine truck is swivel-centered. General dimensions are given in the following table:

Description and General Dimensions.	
Type.....	10-wheel passenger
Number.....	71
Name of builder.....	Brooks Locomotive Works
Name of operating road.....	Burlington, Cedar Rapids & Northern
Gage.....	4 ft. 8½ in.
Simple or compound.....	Simple
Kind of fuel to be used.....	Bituminous coal
Weight on drivers.....	108,000 lbs.
" " truck wheels.....	29,000 lbs.
" " total.....	137,000 lbs.
Wheel base, total, of engine.....	24 ft. 4 in.
" " driving.....	14 ft.
" " total (engine and tender).....	52 ft. 6 in.
Wheels and Journals.	
Drivers, number.....	6
" " diameter.....	69 in.
" " material of centers.....	Cast iron

Truck wheels, diameter.....	30 in.
Journals, driving axle, size.....	8 in. X 9 in.
" " truck.....	5 in. X 10 in.

Cylinders and Valves.

Cylinders, diameter.....	18 in.
Piston, stroke.....	26 in.
Kind of piston-rod packing.....	Jerome metallic
Valves, kind of.....	American balanced

Boiler.

Boiler, type of.....	Crownbar, wagon top
" " working steam pressure.....	180 lbs.
" " material in barrel.....	Homogeneous boiler steel
" " diameter of waist.....	58 in.
Seams, kind of.....	Quadruple riveted
" " circumferential.....	Double riveted
Thickness of tube sheets.....	¾ in.
" " crown sheet.....	¾ in.

Tubes.

Tubes, number.....	224
" " outside diameter.....	2 in.
" " length over sheets.....	12 ft. 7½ in.

Firebox and Smokebox.

Firebox, length.....	9 ft.
" " width.....	2 ft. 9 in.
" " material.....	Homogeneous firebox steel
" " thickness of sheets.....	Side sheets, ¾ in.; back sheet, ¾ in.
" " brick arch?.....	Yes
" " water space, width.....	Front, 4 in.; sides, 3 in.; back, 3 in.
Smokebox.....	Extension front, with Smith triple exhaust
Stack.....	Taper

The Railroad Claim Agent and His Duties.

At the last annual meeting of the Association of Railway Claim Agents, at Pittsburgh, there were entertaining addresses by Dr. W. B. Outten, Surgeon of the Missouri Pacific, and Mr. L. L. Gilbert, Assistant Counsel of the Pennsylvania lines west of Pittsburgh, from which we quote passages which are of general interest.

Dr. Outten discussed the relation between the claim department and the surgeon, emphasizing the wisdom of compromising claims to avoid litigation. In speaking of fraudulent claims and the perplexities of the claim agent, Dr. Outten recited an incident of the Franco-Prussian war of 1870. The excitement at the Bourse in Paris was so great that thousands of men convinced themselves that they had seen and read a telegram announcing French victories, fastened to a pillar inside the Stock Exchange when, in fact, no such telegram ever existed; and the speaker went on to show how persons who have been through a railroad accident work up their imaginations to the point of absolutely believing that they are afflicted with "railway spine" or some other serious ailment when there is no foundation whatever for the belief.

Dr. Outten says that Erichsen, in his work on "Injuries to the Nervous System," did great harm by telling with much detail the amounts of money received by persons who had suffered nervous injuries in railroad disasters. So many cases were quoted where juries had awarded \$5,000 or over that the book has actually exerted a marked effect on American lawyers and juries.

Dr. Outten advocated a closer harmony between the surgeon and the claim agent and described the benefits of an organized hospital department, which he believes advantageous on every road. Such a department makes possible the concentration of all injured employees in the hospital, where the conditions can be of the best. This does not mean, however, that the men are protected from injudicious advisers, for employees in railroad hospitals are always allowed to consult whom they desire. Hospital departments are self-sustaining. Having a well-organized staff, complete histories are made up of all injuries, both to employees and passengers; and by co-operation with the claim agent passenger wrecks are settled with greater celerity than can be done in any other way. By making an early record of every case, injured persons are prevented from subsequently changing their statements and making out a new case under the advice of unprincipled lawyers. The doctor says that on roads with hospital departments the average liability of the company [amount paid] for all deaths and injuries is not over \$35 per capita. Not more than one employee in 200 sues, and not over one passenger in 19. The wisdom of compromising claims is coming to be more and more recognized, and the speaker urged close attention to the subject. In the case of nervous injuries the prospect of gain by litigation actually engenders diseased conditions in many patients, and a patient exaggerating his injuries may, if he acts his part well, get into a hopeless physical condition.

Mr. Gilbert read a paper on the results of the work of the Association during its seven years of existence, holding that the ideal of each member should be to make the association valuable to the members, to the railroad companies and to the public. The last-named element at first seems out of place in this statement, "but," said the speaker, "the public is as much interested as the railroads in suppressing frauds and in reducing extravagant payments, and the claim agent must educate the public by his fair and intelligent treatment of every case." After he has established a reputation for fairness and integrity he will receive the confidence of the public. In the course of his remarks on the flood of litigation now prevailing, Mr. Gilbert mentioned that there were 560 personal-injury suits against street-car companies on the trial dockets of courts in Chicago alone; with, no doubt, numberless other cases which have been begun, but which have not been set down for trial. Most cases of this kind result in large verdicts, and there is no present prospect of a check on this wholesale raid on the earnings of transportation companies. But if this tendency is not checked, like demands will be made upon farmers, manufacturers and merchants; in fact, upon every individual who has sufficient means to respond to a levy by the sheriff.

Urging the importance of consultation between roads, as is possible only in an association, the speaker referred to the excessive liberality of some companies and the meanness of others. Between these extremes the reasonable claim agent finds it impossible to pursue a satisfactory course. This Association may be of great advantage by promoting co-operation between different companies, thus permanently blighting the fields of the shyster lawyer.

"Through the instrumentality of this association, we are enabled to secure the statements of witnesses at distant points, and this without the expenditure of a considerable amount of time and money, and often when the doubt as to the value of the evidence to be secured would make the journey of doubtful value. The testimony is taken by experienced men, trained to distinguish the material from the immaterial, and with sufficient knowledge of human nature to determine with considerable certainty as to the integrity of the persons giving the statements. Each of us will, at all times, gladly serve the others, and as well as though doing the work for his own company. Like services can be and are rendered when settlements are to be made. After the question of liability and amount to be paid in settlement have been determined by the company having the payment to make, the final negotiations can be conducted as well, yes, in many instances even better, by a disinterested party trained to this class of work, than by the party in interest, and this to the advantage of not only the company, but also of the claimant, who is saved an annoying delay, until the adjuster can find time to see him, or the delay and expense of going to a distant point to institute legal proceedings."

This Association, said the speaker, ought to secure uniform statistics. Careful records from a large field would help to secure more instructive averages and be a powerful aid in preventing accidents. In this connection we may remark that it was probably due to Mr. Gilbert's modesty that he made no mention of the fact that he has very excellent statistics of his department, on his own road, for a series of years.

Electric Railroads in Europe.

European countries seem to be somewhat deliberate in adopting electricity on street railroads. A recent census of them by a French journal gives the number of railroads using electricity as a motive power as 111, with an aggregate length of 560 miles. The number of motor cars or engines is 2,747—twice as great as a year ago. Three of the lines have underground conductors, nine work with a third rail, eight with accumulators, and 91 with overhead trolleys. The third-rail conductors are nearly all in England, the accumulators in France.

A Semaphore for Permissive Block-Signaling.

The engravings shown herewith illustrate a semaphore signal recently devised by the National Switch and Signal Company for giving either a permissive or an all-clear go-ahead signal, while yet not using the intermediate position, as is done with the common three position semaphore. In this signal there are two arms on the same spindle, of which one may be lowered while the other is left in the horizontal position; and there need be but one rod or wire to the cabin.

This signal was made for the "Harlem Line" of the New York Central, in Fourth Avenue, New York City. The four new elevated tracks of this line, extending from a point north of the Harlem River, south to 110th street, will carry a very large traffic. The two easterly tracks are for southbound and the other two for northbound trains. The station at 110th street requires 12 levers for the operation of four two-arm signals, four distant signals and four torpedo signals. At 125th street there are 22 active levers for the operation of eight two-arm signals, six distant signals and four mechanical slots. The drawbridge, which is 400 ft. long and spans the Harlem River between 133d and 135th streets, is controlled from a tower located at 135th street, north of the draw. The railroad company desired that the same lock and block signaling, which has been in operation in the Fourth avenue tunnel, south of 110th street for some time, be extended to 135th street.

The signals in the tunnel are pot signals, giving three color indications: green, red and white. The block instruments used to control these pot signals are double instruments controlling two levers, and since the two levers operate the same signal, it was necessary to design a movement with which the two levers could be operated by the same line of connections to the same signal. This was successfully carried out in the tunnel, as described in the *Railroad Gazette*, May 26, 1893; and since all the signals on the elevated structure are high semaphore signals it became necessary to design a special signal for that work.

Two indications, clear and caution (a red and a green blade), are used, so that in case of failure of the track circuit or of the apparatus controlling the signal, preventing the giving of a clear signal, it will be possible to send trains forward by clearing the red blade, leaving the green blade in the horizontal position. The engineer understands that while both arms are not in a clear position he may proceed, knowing that the only reason he did not receive both arms was because the apparatus was out of order. This extreme caution is necessary owing to the large number of trains on these four tracks. It was found that notwithstanding the most careful supervision there were times when trains would be delayed unless this compound signal was operated. While this might be termed permissive signaling, it is not so in fact, for the red blade cannot be cleared unless the section in advance is unoccupied.

Figure 1 is a view of this signal in the danger position with but one semaphore blade visible. Below the regular blade grip will be seen an auxiliary or floating spectacle. The vertical rods, of which there are two, are coupled to a system of compound levers at the base of the pole. The adjustable jaws on the rods are slotted as is the top of the outside rod where it connects with the blade grip.

The floating spectacle is actuated by a horizontal slot in this rod. The signal is operated by a single line of pipe. The interlocking machine has two levers for each home signal, one red and one green. These levers are coupled to a compound lever below the machine, which, in turn is coupled to the rocking shaft. The normal position of the levers and signal is at danger, and in case a clear signal can be given, the operator simply reverses the red lever, thereby pushing the rod connection and clearing both arms, as shown in Fig. 2. In case a clear signal cannot be given by reason of failure in the apparatus, the operator reverses his green lever, thereby exerting a pull on the line of connections, which lowers the outside or red arm to an angle of 65 deg., leaving the green blade in the horizontal position, as indicated in Fig. 3.

It will be seen that the floating spectacle is moved upward to a position in front of the lamp when the green lever is reversed, as shown in Fig. 3. When the red lever is reversed, clearing both arms, the floating spectacle remains in the position shown in Figs. 1 and 2, and the white light shows between the floating spectacle and the spectacle in the blade grip, as shown in Fig. 2. The

blade grip on the green blade, is not fitted with glass and simply acts as a counterweight.

It will be noticed that, by reason of the slot in the jaws of the vertical rod, the reversing of the green lever does not actuate the rod connecting with the green blade; and in reversing the red lever the rod actuating the red blade is not moved, the red blade being carried down by a lug on the blade grip of the green blade, which engages with a corresponding lug on the blade grip of the red blade; so that when the green blade is cleared it carries with it the red blade without actuating the floating spectacle.

This style of semaphore signal is suitable for permissive block signaling. It is not necessary to have two levers in the interlocking machine, as one lever can be made to do all the work; one arm will be lowered by the half stroke and both arms by the full stroke of lever. This can be operated by either pipe or wire, but for moderate distances pipe is, of course, the more desirable.

Cement Testing in Philadelphia.

A paper was read, Oct. 3, by Mr. Richard L. Humphrey, before the Engineers' Club of Philadelphia, on "The Cement Laboratory of the City of Philadelphia, its Equipment and Methods." This laboratory was established in 1892, and since that time has collected over 2,000 samples of 66 brands of cement, both natural and Portland. The tests are made from samples taken from actual shipments on the work, and not from samples

provided with a Vicat needle and Gilmore's wires. The latter are commonly used in this country. They consist of two brass balls, each bearing a wire. For the initial set the section of this wire is $\frac{1}{8}$ in. in diameter, the ball and wire weighing $\frac{1}{2}$ lb. For hard set the section is $\frac{1}{4}$ in. in diameter and the weight 1 lb. For finding the time of setting, cakes of neat cement, 2 or 3 in. in diameter, $\frac{1}{2}$ in. thick, with thin edges, are made on small pieces of glass. When the paste resists the gentle application of the $\frac{1}{2}$ -lb. wire the cement has attained its initial set, and when it resists the pound wire, the cement has its hard set. For quick determinations these wires give sufficiently accurate results for practical purposes. For more accurate determinations the Vicat needle is used. For determining the tensile strength the laboratory possesses a Riehle and a Fairbanks cement-testing machine, each of 1,000 lbs. capacity. While the Fairbanks machine is used on account of its being more nearly automatic, neither of these machines fully satisfy the requirements of the laboratory, and plans have been prepared for an entirely automatic cement-testing machine of 2,000 lbs. capacity, based on a different principle, in which it is hoped that the faults of the present types of testing machines will be corrected.

A great deal of attention is paid to the results of the tests of mortar taken from a mixing box. The briquettes are made from the actual mortar on the work, (1) as soon as mixed, and (2) just before it goes into the work. Experience has shown this to be one of the best aids in judging the actual merits of any brand of cement. All cements are from time to time submitted to a chemical analysis.

Briquettes are broken at stated periods, each sample being tested for tensile strength, both neat and with standard proportions of sand, for 24 hours, 7 and 28 days. Additional briquettes are made, and are systematically distributed for breaking at intervals of 2, 3, 4, 6, 12, 18 months, 2, 3, 4 and 5 years. At the end of each year the results of the year's tests are averaged, each brand of

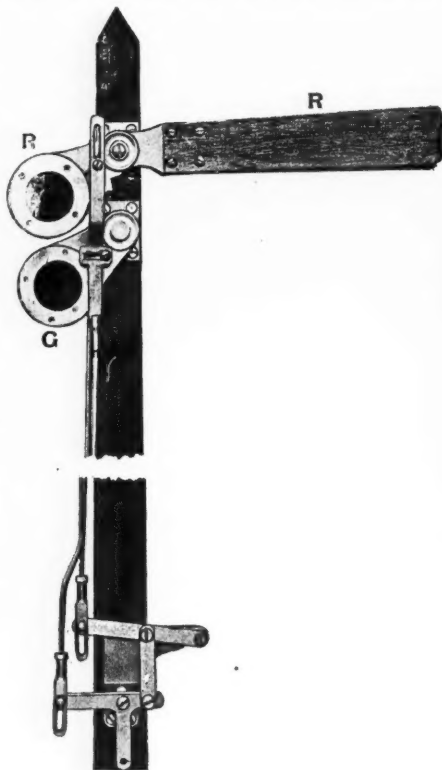


Fig. 1.

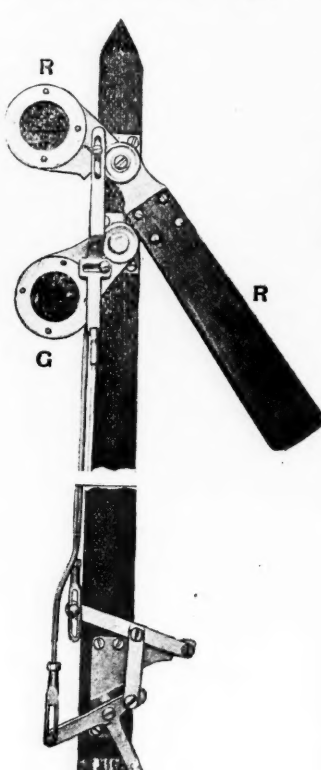


Fig. 2.

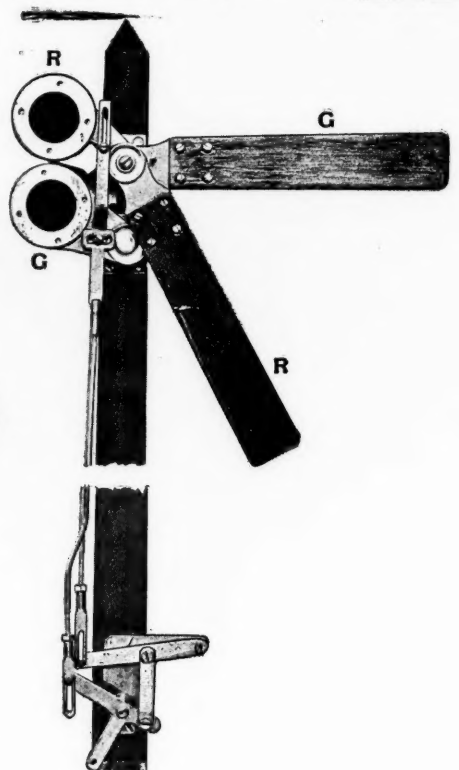


Fig. 3.

Semaphore for Permissive Block-Signaling; made by the National Switch & Signal Company.

furnished indiscriminately. The sample is obtained by taking a small quantity from one barrel in every five or ten, depending on the size of the shipment, the cement being taken from the heart of the barrel in order to secure a fair sample of its fineness and quality. It is then passed through a No. 20 sieve. A small portion is weighed out and made into a paste by adding clean water from a graduate. The quantity of water required to produce a stiff plastic paste, of about the consistency of moulding clay, is thus obtained. One thousand grammes of the sample are then weighed out, and kneaded with the proper amount of water to the right consistency; it is then firmly pressed into the moulds and the surface smoothed. The moulds are of brass, both single, and in gangs of three and five, the parts being held together by means of a clamp. Gang-moulds are generally used, the briquettes being moulded three or five at a time, according to the rate of setting.

In making sand briquettes, the sand and cement in proper proportions are weighed out and thoroughly mixed dry on the mixing slab; then the process is the same as for the neat briquettes. Mixing and moulding by hand has been found to produce more uniform results than can be obtained with any of the machines now in use. Experience has shown that greater uniformity in the results is obtained by mixing to the proper consistency and moulding as quickly as possible, the aim being to have the cement in the mould before incipient setting commences. The briquettes, prior to their immersion in water, are kept in moist air for 24 hours, except in the case of the 24-hour tests, in which they are immersed after hard set. For this purpose there is used a moist closet, which has replaced the old method of covering briquettes with a damp cloth. When closed, this closet is perfectly tight; there is water in the bottom, which keeps the air moist, preventing the briquettes from drying out, and thus checking the process of setting.

For preserving the briquettes in water, six soapstone tanks, each 7 ft. long, 2 $\frac{1}{2}$ ft. wide, and 7 in. deep, having a capacity for over 10,000 briquettes, are used. Each tank is supplied with a continuous stream of water, at a temperature never less than 70 deg. Fahr.

For determining the time of setting, the laboratory is

cement being rated according to this average, the requirements of the specifications for the ensuing year being fixed in accordance with these results.

A New Brakeshoe.

Considerable interest has been shown in the development of a new brakeshoe made by the Composite Brake-shoe Co., of Boston, of which Mr. W. W. Whitcomb, the President of the company, has secured patents. The company has been testing the merits of the shoe on the engines and cars of several New England railroads, including the Boston & Maine.

The shoe is made of cast iron, in which are inserted wooden plugs in such way that both the iron and the end of the fiber of the wood come in contact with the wheel.

This shoe was tested by the Master Car Builders' Committee on Laboratory Tests, at Wilmerding, Pa., and results were given in our issue of July 31, page 536. These tests showed that the shoe gave a somewhat higher coefficient of friction than the ordinary metal shoes, and that the pull on the dynamometers was nearly uniform throughout the whole stop. It was found that while the shoe was well adapted for light service, such as on street railroads, where it is already quite extensively used, the wooden plugs could not withstand the heat generated in stopping the heavy and fast trains of the steam railroads. The wood charred at the ends of the plugs and they contracted sufficiently to come out of the holes.

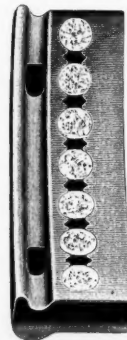


Fig. 1.

The inventor had in mind two main ideas in the use

of these wooden plugs: To get a higher co-efficient of friction, and to reduce the wear of that part of the tread of the wheel which does most of the work on the rail. Both of these ends he has sought to accomplish by the introduction of a soft material in that part of the face of the shoe which comes in contact with the wheel tread near the flange.

The defects of the wooden plugs for steam railroad service having been ascertained, the latest efforts of the inventor have been to overcome these defects by the use of cork. It was found that heat caused the cork to expand, and also that it showed a higher co-efficient of friction than the wooden plugs. It also adapts itself to the rough surfaces of the iron with which it comes in contact in the sockets of the shoe.

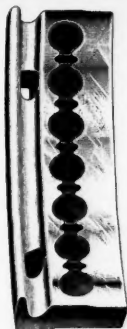


Fig. 2.

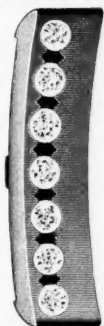


Fig. 3.

Pieces of cork somewhat larger than the sockets are compressed and forced into the holes as shown by the cuts, Fig. 1 represents a driving-wheel shoe before it is worn, and Fig. 2 one that has been in service for two months, making 11,970 miles on a train making frequent stops. Figs. 3 and 4 show a new coach shoe, and one that has done service on an engine tender, making 6,510 miles, besides other stops in switching. It will be seen that these shoes are only partly worn out, and that the cork has spread into the spaces between the insets. Other shoes are to be seen at the office of the company that are worn out and still hold the cork. We are not aware of the results of any laboratory trials to ascertain the relative co-efficient of friction of these shoes with the cork plugs, but the testimony of engineers indicates that, with the same pressure they hold better than a metal shoe.

Further information can be had by addressing the company at Boston, or the East Buffalo Iron Works, Buffalo, N. Y., where the shoes are also being made.

A Brooks Tank Locomotive for Japan.

The Brooks Locomotive Works has recently completed and shipped to Japan a double-end side tank locomotive for the American Trading Company. This locomotive, which we illustrate by the accompanying engraving, is one of an order for two which was given to the Brooks Works. As may be seen, it has six coupled drivers, a two-wheel radial leading truck and a two-wheel trailing truck. It is designed for a minimum curvature of track of 400 ft. The allowable weight per axle is 12 tons. The two side tanks are 1,200 gals. capacity, and the feed water is supplied by two Sellers injectors. The coal box has capacity of 2,240 lbs. of bituminous coal. The boiler is covered with $\frac{1}{2}$ -in. asbestos boards. The cab is of steel. This locomotive is 3 ft. 6 in. gage; the maximum clearances are: height, 11 ft. 10 in.; width, 8 ft. The following table gives the general dimensions:

Description and Journal Dimensions.

Type.....	Double ender, side tank
Name or number.....	4
Name of builder.....	Brooks Locomotive Works
Gage.....	3 ft. 6 in.
Simple or compound.....	Simple
Kind of fuel.....	Bituminous coal
Weight on drivers.....	78,000 lbs.
" truck wheels.....	Front, 11,000 lbs.; rear, 11,000 lbs.
" total.....	100,000 lbs.
Wheel base, total, of engine.....	23 ft. 8 in.
" driving.....	10 ft. 4 in.
Heating surface, total.....	950 sq. ft.
Grate area.....	14.5 sq. ft.

Wheels and Journals.

Drivers, number.....	6
" diameter.....	48 in.
" material of centers.....	Cast iron
Truck wheels, diameter.....	26 in.
Journals, driving axle, size.....	$6\frac{1}{4}$ in. x 8 in.
" truck.....	$4\frac{1}{2}$ in. x 7 in.

Cylinders and Valves.

Cylinders, diameter.....	15 in.
Piston, stroke.....	22 in.
Kind of piston rod packing.....	U. S. Metallic
Valves, kind of.....	Slide, balanced

Boiler.

Boiler, type of.....	Radial stayed, straight top
" working steam pressure.....	150 lbs.
" material in barrel.....	Homogeneous boiler steel
" thickness of material in barrel.....	$\frac{3}{4}$ in. and $\frac{1}{2}$ in.
" diameter of barrel.....	64 in.
Seams, kind of horizontal.....	Double welded and quadruple riveted
Seams, kind of circumferential.....	Double riveted
Thickness of tube sheets.....	$\frac{1}{2}$ in.
" crown sheet.....	$\frac{3}{4}$ in.
Crown sheet stayed with.....	Radial stays

Tubes.

Tubes, number.....	210
" material.....	Solid drawn brass
" outside diameter.....	1 1/4 in.
" length over sheets.....	9 ft. 4 in.

Firebox and Smokebox.

Firebox, length.....	6 ft. 6 in.
" width.....	2 ft. 5 in.
" material.....	Homogeneous steel
" thickness of sheets.....	$\frac{3}{8}$ in.
" water-space, width.....	Front, $2\frac{1}{4}$ in., sides, 3 in.; back, 3 in.
Grate, kind of.....	Cast iron, rocking

Smokebox.

Smokebox.....	Extension front
Stack.....	Straight

The Detective Camera and Some Other Things.

The engineer whose duty it is to watch the contractor has a wonderfully useful little ally in the camera. The photograph reproduced herewith, which shows the process of filling a trestle, is an instance of the truth of this profound aphorism. This photograph was taken on the line of the Central New York & Western Railroad and shows a piece of a large trestle which was filled under the directions and specifications of Mr. William Barclay Parsons. The specifications were strict with regard to boulders, but it is obvious from the photograph that boulders could not always be kept out.

Another point of perhaps still more interest in this photograph is the representation of the device used by the contractor to protect the trestle while filling. One of the most troublesome incidents of such work is the knocking off of the braces by the coarse material. This contractor made a screen of rough hemlock planking either side of the deck of the trestle. This screen sifted the material, allowing the fine material to fall directly through the trestle and diverting the coarser material so that it did not hit the bracing of the upper story. In the view here reproduced the screen in front is shown much fore-shortened, the photograph having been taken from below. A better idea of its relative position is given in the background.

Some English Railroad Matters.

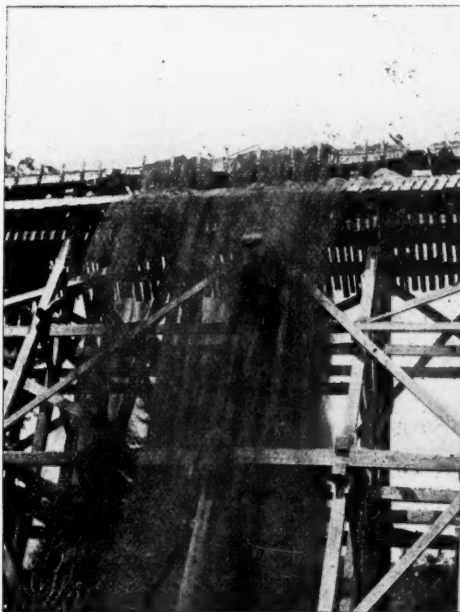
Railway Servants' Hours of Labor.—The third report of the Board of Trade under the Railway Regulation Act, 1893, deals with the hours of labor of railway servants. The act, it will be remembered, provides that whenever a complaint of overwork is made, even anonymously, by or on behalf of any railway servant or servants, the Board of Trade shall enquire into the matter. The Board, if satisfied with the truth of the representation, may call upon the company concerned to reduce the work within reasonable limits, and if the company refuses to comply the Board may apply to the Railway Commissioners, who, after judicial investigation, can issue such binding order on the subject as they may think proper.

The Board of Trade report shows that 97 cases were inquired into in the year ending July 27, 1896, as compared with 156 and 72 respectively in the two previous years. "The department has every reason," says the report, "to be satisfied with the working of the act during the past year. In a large number of cases the railway companies have responded very fairly to the demands made upon them by the Board of Trade, and have met complaints as to long hours in a reasonable spirit. . . . The number of railway employees who have obtained the benefit of shorter hours of work must be very large, but it is impossible to give figures. . . . The railway companies have also been busy in doing a great deal of voluntary work in the revision of hours of labor." The report goes on to point out that, where the companies have voluntarily revised and rearranged their time schedules, they are naturally disinclined to upset the symmetry of their new arrangements by concessions to Board of Trade representatives in individual instances.

The department, therefore, has in certain cases to face the alternative of either accepting the refusal of the companies to reduce hours or else instituting judicial proceedings before the Railway Commission to enforce compliance. At this point there arise two serious difficulties. The first lies in the difficulty of obtaining legal evidence. Men who would be ready enough to give private information will refuse to appear publicly in the

will refer the matter of the complaints to the Commissioners. . . . It is not unlikely that before the time arrives when another annual report must be presented to Parliament the Department may have acquired further experience of the working of the statute."

Summer Passenger Traffic.—A good deal was said in the newspapers this year of the probability of the renewal of the race to Scotland. The fact, however, is that early in the summer representatives of the two rival routes held a meeting at which terms were agreed upon which made any further increase of speed exceed-



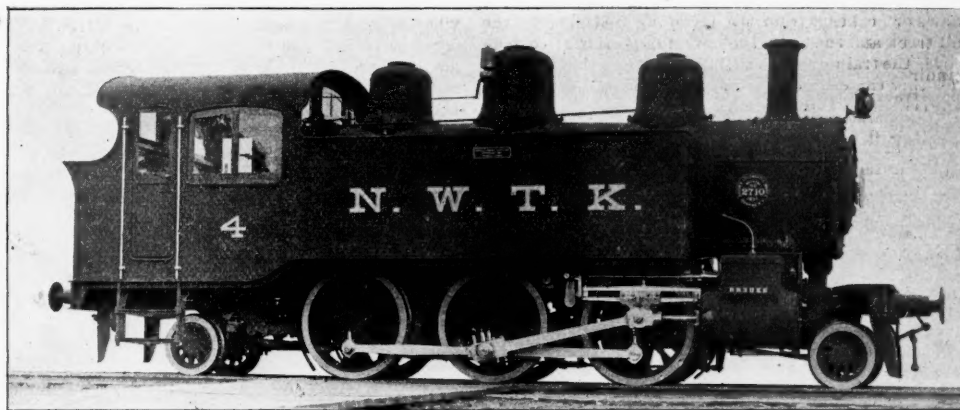
Filling a Trestle—A Snap Shot.

ingly unlikely. Even had there been any intention that way, the Preston accident would have put an end to it. Consequently, there are no exceptional feats of speed to be recorded on these lines. Their summer traffic, however, has been heavy beyond all precedent. Two instances may be given. On the evening of July 31 the Great Northern started from King's Cross no less than 14 expresses for Scotland. On Aug. 10 the 8 p. m. Highland express from Euston, which is only one of the five North Western Scotch night expresses, ran in four portions, consisting in all of 68½ vehicles (an eight-wheeled coach on the North Western counts 1½). In the matter of express running it is perhaps the Great Western that gains the palm this year. For during August and September its Cornish express ran in two parts from Paddington, the first portion leaving at 10:25 a. m., and reaching Exeter, 194 miles off, without any intermediate stop, at 2:10. This is, I believe, the longest run ever made anywhere in regular daily working.

W. M. ACWORTH.

Electric Switching on the Brooklyn Bridge.

On Nov. 30, 12 electric motor cars were put in service for switching purposes at the terminal stations of the Brooklyn Bridge. When all the cars arrive their number will be increased to 20. The new cars do not differ



Brooks Tank Locomotive for Japan.

witness box. The second and perhaps more serious difficulty is stated in these terms:

"The Board of Trade have managed with some success to keep the question of reasonable hours of labor untouched by that of wages. As a rule, the payment of wages has not entered into the question of hours of work. If, however, an order is made by the Railway Commissioners which will compel the reduction of hours of a large body of servants, it will not be surprising to find that the company or companies affected would endeavor to put in force a proportionate reduction in pay." The report concludes by saying that in certain cases sufficient evidence seems likely to be forthcoming and that if this proves true "the Department

outwardly from those in regular service. Their length is 45 ft. over all, and the total weight with the motors is about 30 tons.

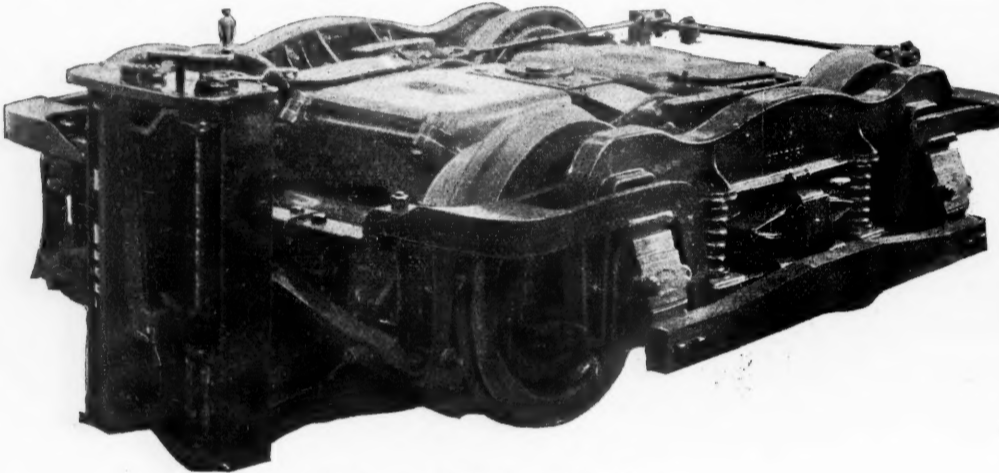
The McGuire trucks, one of which we illustrate, have been designed especially for these cars. In these trucks the draft of the train is taken directly on the journal boxes instead of through a swinging bolster, the entire top frame having sufficient lateral motion to cushion on curves. The top frame is held in central position in relation to the wheels by a double-rocker connection between the truck and the elliptical springs, part of the strength of these being used to cushion the side motion of the truck on curves, and return it to its normal position on the straight track. The weight of each truck is

1,000 lbs., wheel base 5 ft. 6 in. This narrow width is obtained by omitting the swinging bolster.

The general character of the electrical part of the new apparatus is similar to that in use on the Metropolitan West Side and Lake Street elevated railroads in Chicago and on the Nantasket Beach branch of the N. Y., N. H. & H. R. R. Each motor car has four G. E. 50 motors and two K. 14 series parallel controllers—motors and controllers were both especially designed to meet the peculiar requirements of bridge traffic. The motors have the usual characteristics of all general electric railroad motors, and are spring-suspended.

The series parallel controllers embody the magnetic blow-out principle, and in their operation, when the current is shut off, resistance is first introduced and the potential at the motor reduced before the circuit is broken. This avoids any strain on the motors due to sudden rupture of the current. When the circuit is broken the arc is immediately blown out and the contacts do not suffer, the blow-out serving to chill the arc by spreading it over the surface of the breaking points instead of confining the root of the arc to its point of origin and consuming it. The 12 resistances are suspended beneath the cars and are of the packed ribbon type set in open iron boxes. Beneath each platform is an automatic circuit breaker, which effectually prevents any injury to the motors from a sudden rush of current. The breakers which take the place of the circuit hood switches are set at 800 amperes, and should the current exceed this, a latch is tripped by the action of a solenoid, and the contacts in the device are instantly separated, breaking the circuit. Additional protection is provided by cut-outs also embodying the magnetic blow-out principle, whereby the arc formed at the disruption of the fuse is magnetically extinguished.

The current is taken from a third rail in a manner similar to that used on the Lake Street Elevated in Chicago. This third rail runs on the outside of the service track and parallel with it across the bridge, and is an ordinary Tee rail, bonded with two No. 0000 bonds.



The McGuire Truck—Brooklyn Bridge Cars.

The shoes are of cast iron, about 12 in. long by 10 in. wide and $\frac{1}{2}$ in. thick. Each weighs about 10 lbs., and is wide enough to slide over all breaks on the third rail at all switches and crossings, and one shoe is always in contact. An insulated flexible cable connects the shoe to the motor.

When the train empties at the terminal the motor car draws or pushes it from the incoming platform to the tail track and thence to the outgoing platform. It then moves the train over the tilting sheaves so that grips on the other three cars may seize the cable, when the current is shut off and the cable performs its ordinary functions. Under the conditions of the contract, the power of the four motors must be sufficient to propel the fully loaded train weighing 120 tons across the bridge at the speed of the cable, 11.3 miles an hour, in case of breakdown of the cable. With the motors the heaviest bridge trains are readily hauled up the 3.78 grade. During the early morning hours the motor cars will handle the entire traffic of the bridge after the cable has stopped running.

Fast Trains in Continental Europe.

BY J. PEARSON PATTINSON.

In former articles in the *Railroad Gazette* I have given some details of a record trip on the Northern Railroad of France, and of a fast run on the Prussian State Railroads between Berlin and Hamburg. These notes I now propose to supplement by giving some particulars of (a) the fastest third-class train in France, and (b) some German express trains with very heavy loads behind the engine.

(A) *The Fastest Third-Class Train in France.*—The honor of possessing the fastest long-distance train carrying third-class passengers in France belongs to the Eastern Company, who, at a comparatively recent date, have put in service each way between Paris and the Belgian frontier a capital express, making the creditable run between Paris and Reims (just under 97½ miles) in exactly two hours on the down journey and in a few minutes more on the up. The figures below give an instance from actual working of the down train. It will be ob-

served that the first few miles out of Paris are, as might be expected, run over at a moderate pace and that there is a service check between Tillport and Isles Armentieres. The gradients are, on the whole, fairly easy. The train is not a heavy one, averaging about 135 tons, excluding engine and tender, and is made up exclusively of small four or six-wheeled stock weighing from 9 to 12 tons only according to class.

Kilometers.	Stations.	Actual time.	Remarks.
9	Paris (Est.).....	8 23 41	Engine 828 (latest Est type).
10	Noisy-le-Sec.....	8 33 4	Load: 12 coaches (about 135 tons).
13	Raincy.....	8 36 3	Train checked slightly by signals just after leaving Paris.
14	Gagny.....	8 36 53	
18	Chelles.....	8 39 56	
27	Lagny-Thorigny.....	8 46 45	
36	Fesby.....	8 53 12	
44	Meaux.....	8 58 31	
50	Tripport.....	9 2 58	Speed very greatly reduced after Tripport for sharp curve.
57	Isles-Armentieres.....	9 8 48	
60	Lizy.....	9 10 48	
68	Crouy.....	9 16 40	
74	Mareuil.....	9 20 16	
80	La Ferté-Milon.....	9 24 42	
92	Neuilly.....	9 33 47	
98	Oulchy.....	9 38 11	
110	Fere-en-Tardenois.....	9 47 7	
115	Loupeigne.....	9 50 51	
121	Mont Notre-Dame.....	9 54 48	
124	Bazoches.....	9 57 8	
129	Fismes.....	10 0 56	
135	Breuil-Romain.....	10 5 22	
140	Zonchery.....	10 8 26	*Lost quite 4 minutes after St. Brice owing to single line working over bridge (repairing).
148	Muizon.....	10 13 43	
153	St. Brice.....	10 17 23	
156	Reims.....	10 24 42	

(b) *Fast and Heavy German Express Trains.*—The observant traveler in Germany who takes an interest in railroad matters cannot fail to be struck with the fact that, although in the actual speed of its express trains the German Empire must rank second to France, yet by reason of the very great weight of many of the German

Schneidemuhl to Berlin, 152¾ miles, in 2.27¼ minutes (net).

Kilometers.	Stations.	Time due p. m.	Time actual.
	Schneidemuhl.....dep.	3 11	3 21 39
68.4	Kreuz.....arr.	4 02	4 12 30
	".....dep.	4 06	4 17 30
71.5	Vordamm.....arr.	4 21	4 32 40
	".....dep.	4 21	4 34 16
88.7	Friedeberg.....arr.	4 39	4 50 51
	".....dep.	4 39	4 51 33
117.5	Landsberg.....arr.	5 07	5 18 25
	".....dep.	5 11	5 23 34
161.0	Custrin (Vorst.).....arr.	5 49	6 2 12
	".....dep.	5 51	6 4 20
163.2	Custrin (Stadt).....arr.	5 59	6 9 40
	".....dep.	6 03	6 12 28
245.9	Berlin (Schlesischer).....arr.	7 15	7 27 34

REMARKS: The engine was not changed during the respective trips, but on the eastbound run an assistant engine was used between Custrin (Vorst) and Landsberg. The locomotive was of usual four-coupled bogie type (Bromberg Administration). Eight corridor vehicles and three vans (280 tons in all) formed the train. Except on the return journey outside Berlin there were no signal delays en route.

The Bowen Dynagraph.

It is now nearly 17 years since we first published a description, with illustrations, of Mr. P. H. Dudley's dynagraph machine designed to automatically record the condition of a railroad track. Since that time Mr. Dudley has traveled over many thousands miles of steam railroads, making complete records of their track as to line and surface, and we have occasionally published facsimiles of the record sheets. This beautiful machine, which has been carried to great precision, is expensive and much more elaborate than is necessary for street railroad work. A simpler machine especially designed for street-car lines is now in use on the Chicago City Railroad. When Mr. Bowen, Superintendent of the above road, was preparing the plans he was not aware that a machine for a similar purpose had ever been constructed, and it was not until after his drawings had been completed that he was informed of Dudley's dynagraph. A description of Mr. Bowen's "indicator car," as he called it, was contained in the paper on "Track and Track Joints," presented at the St. Louis meeting of the American Street Railway Association, an abstract of which was printed in the *Railroad Gazette* Nov. 6, of the current year. In that issue there were also published some diagrams taken by this machine. It will be well to review some of the more important features of the car as printed at that time, in order to complete this description.

The car weighs 3,865 lbs., and when the records are being made it is fastened to any ordinary car which is drawn over the track at a uniform speed. It has a platform 8 ft. x 10 ft., mounted on a single truck. The dynagraph automatically records the conditions of the track, and Mr. Bowen's original idea was to make the records show the excess of power which is required to draw the car, because of the faults, in dollars and cents per ton of load when capitalized. This result multiplied by the ton miles on any road tested would show accurately the amount which should be expended on track reconstruction and put a stop to expensive guessing. In regard to the above plan, Mr. Bowen writes us as follows:

"It was our original idea to rule off paper which would express in dollars and cents this dynamometer pull for a ton mile, but experience has demonstrated that it is unnecessary, as any intelligent man using the instrument for a short time is able to make a deduction from the dynamometer pull, express it in dollars and cents per ton mile, which multiplied by the ton miles on that particular road for one year will give you, capitalized, the amount that you could, with judgment, spend upon the repairs to tracks."

"Anyone using the car for a short time, making a few calculations from the profiles, reducing the excess horsepower for poor joints, etc., from the dynamometer pull to the cost in dollars and cents for this excess pull, will be enabled in a short time to tell by simply looking at the dynamometer pull the cost per ton-mile of excess horse-power expressed in dollars and cents."

The records show high and low rails, low joints, gage, drawbar pull and variations of track level. The records

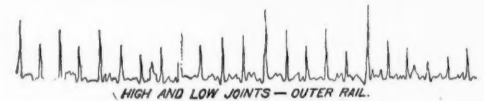


Fig. 4.—Record Taken by the Bowen Dynagraph on Old Rails.

are plotted on a paper 18 in. wide, which unwinds from the drum B, Fig. 1 and 2, at the uniform speed of 1 ft. for every 1,000 ft. of track. Fig. 3 shows the recording pins. For convenience, the wires which operate these pins are lettered the same in both Figs. 2 and 3.

The dynamometer consists of two drawbars, P, Fig. 1, one at each end of the car and extending beneath the platform to a distance of about 1 ft. from each other. Between the two adjacent ends a spring is placed, and a movement of this spring changes the relative length of the wire C and moves the recording arm marked "Dynamometer" in Fig. 3. The apparatus for showing the difference in level of the rails is mounted on the platform and consists of two cups of mercury, G and H,

Berlin to Russian Frontier Service.
Berlin to Schneidemuhl, 152¾ miles, in 2.19¼ minutes (net).

Kilometers.	Stations.	Time due a. m.	Time actual.
82.7	Berlin (Schlesischer).....	9 17	9 20 30
	Custrin (Stadt).....arr.	10 34	10 36 30
	".....dep.	10 40	10 41 0
84.9	Custrin (Vorst.).....arr.	10 42	10 45 20
	".....dep.	10 42	10 47 30
128.4	Landsberg.....arr.	11 21	11 21 20
	".....dep.	11 25	11 26 30
157.2	Friedeberg.....arr.	11 52	11 52 10
	".....dep.	12 04	12 05 30
174.4	Vordamm.....arr.	12 11	12 12 15
	".....dep.	12 11	12 12 45
187.5	Kreuz.....arr.	12 25	12 24 0
	".....dep.	12 29	12 28 10
245.9	Schneidemuhl.....arr.	1 29	1 18 40

Fig. 2, into which dip two plungers connected to a recording arm by means of the wire B.

The records showing the high and low joints, or other variations in surface, and the changes in gage are accom-

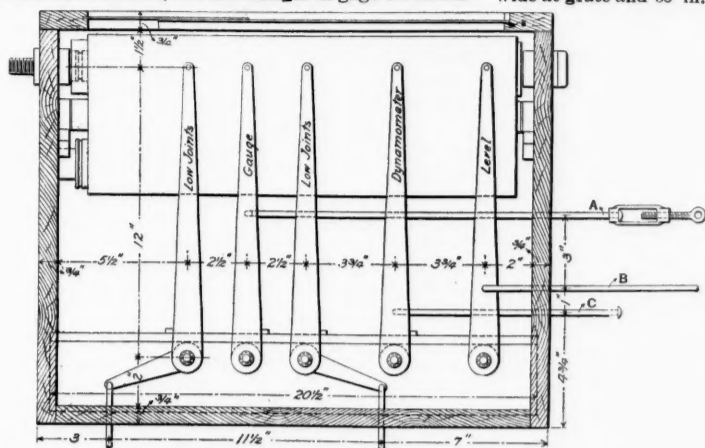


Fig. 3.—The Recording Pins and Drum—Bowen's Dynagraph.

plished by means of the midway wheels *M*, which rise and fall as the surface of the track varies, and also move apart and approach each other as the alignment changes. The journals allow a free vertical and longitudinal movement of the midway axles. The car rests directly on the other axle bearings, *N* and *O*, Fig. 1, so that the vertical movement of the midway wheels give an accurate measure of the low places. As the forward wheel passes over a low joint it drops down into it, and this causes a relative rise in the midway wheels, which is recorded on the paper in one direction from the normal

10 in. track. First 2, use boilers made for Steubenville railroad. Boiler, waist 46 in. diam. at front end and taper to 47 1/2 in. at the shell. Firebox, 5 ft. 6 in. long (being 8 in. longer than first engines of this class, 35 in. wide at grate and 38 in. wide at the crown, 5 in. water space fore and 4 in. aft, and 3 in. on sides of firebox. For the first two engines use boilers made for Steubenville & Indiana, with the seams made inside of the firebox and for the remaining four make the seams in the water space. Waist shortened 1 in., shell lengthened 1 in. forward, 76 1/2 or 1 in. nearer driving wheel. Cylinders, 19 in. diam. 22 in. stroke, the first two to be 18 1/2 in. diam. Pistons, outside rings to be 1 in. thick and babbitted. Cylinder cocks to have 3/4 in. opening to be opened from foot board. Valve motion independent, variable cut-off with partition plates. Connecting rods, main rod flattened on inside to clear wrist pin or forward in any position. Wheels drivers, 49 in. diam. with 2 in. tires; front pair without flanges; truck, 28 in. diam.; truck spread, 60 in. center; pin, 11 in. from end of boiler. Tires to be put plan with standing collar, straight neck, 60 in. diam. at top with 15 in. diam. inside pipe, and made of No. 15 iron not to exceed 14 ft. 6 in. from rail. Cow catcher, made of iron as per sketch sent. Throttle valve, made to move easier, also the reverse to move easier. Pumps arranged with vacuum and air chambers, and with Emerson patent valves. Feed pipe of copper with slide stop valves to be operated from foot board. Domes, with cast-iron bases, and heads cap polished and finished with beaded band at the top. Blast pipe, leading from dome to chimney for blowing fire while standing. Fixtures, lamp stand, scroll pattern and to be charged extra. Tubes of copper in the first nine and the tenth to be of

to prohibit, so far as possible, Sunday work in railroad freight service. Recently the Congress of the Confederation has modified these laws, with the declared object of facilitating the handling of the fall traffic of 1896. These modifications permit the unloading of fruit, new wine, potatoes and other farm produce, "so far as it may be indispensably necessary," on Sunday forenoons, by railroad employees. A special freight train may be dispatched Sunday forenoon for the transportation of the above-described farm produce, and for the distribution of empty cars to stations where required. But freight may not be received for shipment nor delivered on Sunday, and the freight-houses and loading platforms must be closed to the public on that day. The men must not work on Sunday more than the maximum hours prescribed for a day's work, and all the time they work must be made up to them before the end of the year.

The Railroad Society of Berlin (Verein für Eisenbahnkunde) offers a prize of \$360 for the best essay on Competition between Railroads and Canals, and one of \$190 for one describing and criticising the methods employed for measuring the speed of trains.

Mr. von Borries, the eminent locomotive engineer, in a paper on "Recent Progress in Locomotive Construction," concludes that, with proper construction, a load of 17,600 lbs. per wheel is not objectionable.

One of the longest railroads in Russia, extending from the Polish border at Brest, east by north to Moscow, has been made a state railroad.

In accordance with the contract between the Austria government and the Emperor Ferdinand Northern Railroad, the state is entitled to one-half of the net

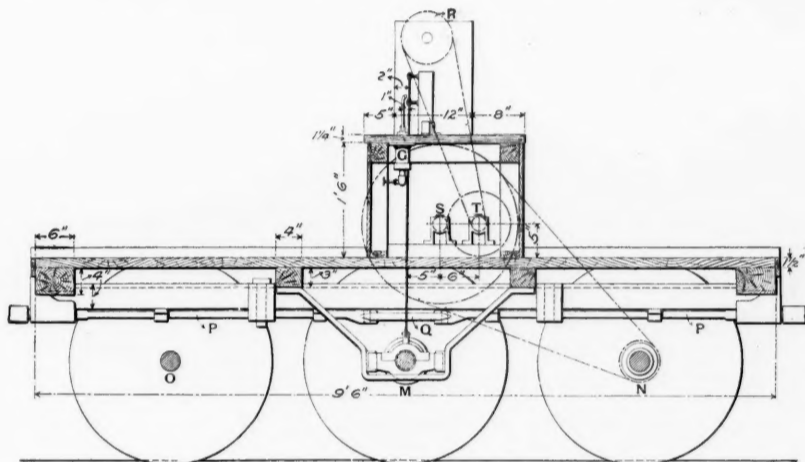


Fig. 1.—The Bowen Dynagraph for Street Railroads.

ne; and then the rear wheel drops into the low joint, which is recorded in the same manner as when the front wheel passed the low joint. The passing of the three wheels over a low joint causes the glass pen to make two short deflections in one direction and a much longer deflection between the other two and in the opposite direction. Only the middle deflection is used in determining how low the joint is. Fig. 4, which is a diagram taken by this machine from old rails, will show this point more clearly.

The manner in which the differences of the gage is recorded by means of the longitudinal movement of the wheel on the midway axle will be seen by referring to Fig. 2. In the middle of the axle is a cylinder *D*, containing a spring which is compressed or extended as the gage increases or diminishes. Any change in the relative position of *F* and *D* will move the wire *A* which is attached to the recording arm marked "Gauge" in Fig. 3.

Two Record-Breaking Locomotives.

The accompanying engravings show two record-breaking locomotives, one having been built nearly 40 years in advance of the other, and both engines being of the 10-wheel type and designed for passenger service.

The upper engraving is from an old colored print of the locomotive "President," which was one of six built by the Baldwin Locomotive Works in 1856, for the Cleveland & Pittsburgh road. The driving-wheels were 51 in. in diameter, and the cylinders 19 in. by 23 in. stroke.

The lower engraving shows Locomotive No. 564, built by the Brooks Locomotive Works for the Lake Shore & Michigan Southern in 1895. The record-breaking run of this engine was made Oct. 24 of that year, when it drew a special train of three cars from Erie to Buffalo, 86 miles, in 70 minutes and 46 seconds, a rate of 72.92 miles an hour. On this division, 33 miles were run at 80.6 miles per hour, and for one mile west of Brocton, N. Y., the rate was 92.3 miles an hour. A full description of this engine was given in the *Railroad Gazette* of Nov. 1, 1895.

The specifications from which the six Cleveland & Pittsburgh engines were built, in 1856, are as follows:

27-TON D. JAN. 5, 1856.

Six engines for Cleveland & Pittsburgh Railroad, 4 ft.,

iron. Tender tank to contain 1,959 gals., 8 ft. wide, 40 in. deep; 24 in. legs on two trucks. Height of flange from rail not over 8 ft. Frame 6 ft. 3 1/2 in. center of sides across with guard rail and brackets. Back drag 28 in. from rail to center of lower sill at opening.

Foreign Railroad Notes.

The Russian authorities have modified their regulations for the transportation of live stock, and established the following as the time within which cattle shipments must be delivered: For distances of 250 versts (167 miles) or less, 24 hours; 333 miles, 48 hours; 532 miles, three days; 731 miles, four days; 931 miles, five days; greater distances, an additional day for every additional 233 miles (350 versts). In the calculation of distances, 150 versts (100 miles) are allowed for loading and unloading, 100 versts for every transfer from one railroad to another, and an additional 100 versts for a transfer between railroads of different gages and 100 versts for ferry transfers over rivers. At the same time, the time limit for delivering express freight was changed. A day is allowed for the first 300 versts (200 miles), instead of for 250 versts as formerly; two days for 400 miles, three days for 666 miles, and one day for every additional 400 versts (266 miles). For transfers between roads of different gages 200 versts are allowed, and all at certain junctions, to be specified where transfers are difficult.

In Switzerland, not long ago, laws were made intended

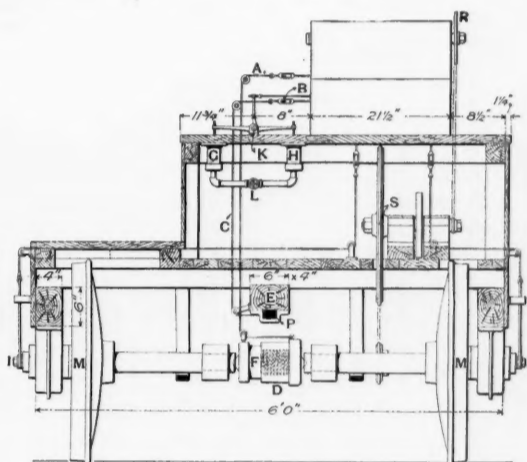
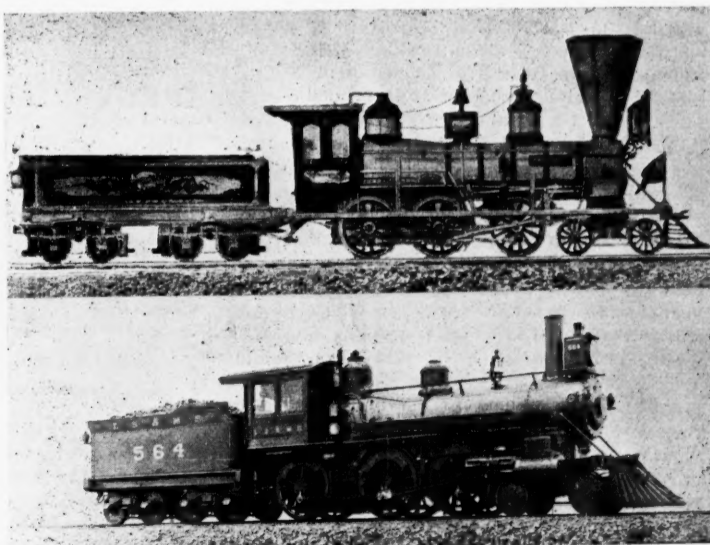


Fig. 2.—Details of Construction.

profits of the company over and above the fixed charges, and six per cent. on the capital stock. Its share this year is likely to amount to about 1,300,000 florins, or more than \$500,000. Where such contracts exist, it is noticeable that the companies are likely to be very liberal with their expenditures in prosperous years.

The interest or other fixed charges of the Austrian



Two Record-Breaking Locomotives.

State railroads for the current year will amount to about 55,000,000 florins; the net earnings of the railroads will be about 32,000,000 florins, leaving a deficit of 23,000,000 florins (about \$11,000,000). The net earnings are about 2 1/4 per cent. on the investment.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Grain Rates Under a Despotism.

The Russian farmers, like our own, have been complaining bitterly of the very low prices of grain and live stock, and like some other farmers they have been trying to get the railroads to help them out. That they have suffered there is no doubt, and as many of them are deeply in debt, unprofitable prices for farm produce mean ruin to them. A statement of grain prices in different Russian markets in different recent years and in July of this year recalls the figures in our Western states in the times when the farmers were said to be burning their corn for fuel.

In Samara, in the "Far East" of European Russia, which is similar to our "Far West," in being distant from the markets for its surplus, rye, which was worth from 34 to 50 cents a bushel in 1886, 26 to 45 cents in 1887, and 28 to 48 cents in 1890, would bring but 13 cents last July; at the same place wheat ranged from 35 to 51 cents last July, against 63 to \$1.30 in 1887; and these were by no means the lowest prices, the reports of the Minister of Finance showing that in extensive districts in the East and Southeast rye would bring only from 11 to 19 cents a bushel, and in Slatoust, near the Ural Mountains, and south of that place, the price was often less than 11 cents even.

In Moscow near the close of 1895 a great convention of Russian farmers was held, at which it was resolved to petition the government to reduce the railroad freights on grain and live stock to 0.01 kopek per poood per verst, which is equivalent to 0.42 cent per ton per mile. This petition was respectfully and carefully considered by the authorities, who reported very fully upon the probable effect of such a change when they rejected the proposition. This detailed statement of the reasons for adopting or rejecting a policy which affects a large part of the public might, by the way, be imitated with advantage in some countries which boast of being more enlightened and more attentive to public opinion than the Russian Empire.

The report says that three investigations of the Russian rates have been made since 1887, and that in 1893 the grain rates were thoroughly revised and very carefully systematized with regard to their permanent effect. The rate proposed by the farmers would reduce the earnings of the railroads by \$20,000,000, seven-eighths of which loss would fall on the State Treasury, and one-eighth on the stockholders of the private railroads. Some of the railroads would lose their entire net earnings. This loss could not be made up by raising rates on other freight nor by an increase in grain shipments; in 1894 it would have required the shipment of 1,800 millions of bushels at the proposed rate to make up the sum earned at the actual rates, instead of the 419 millions actually carried. And were the reduced rates adopted, doubtless so much grain would be thrown upon the market from distant districts that prices would fall still further. The actual tariff, adopted in 1893, raised some rates and reduced those for long distances, but made the aggregate earnings from grain slightly smaller. The report contains a table of the rates for

different distances at the actual and at the proposed rates, showing that the reduction for long distances would be so much greater than for short ones that the effect must be to change greatly the values of lands, increasing them in some places and reducing them in others.

The Right of the Interstate Commerce Commission to Make Rates.

The decision of Judge Sage in the suit of the Interstate Commerce Commission against the Cincinnati, New Orleans & Texas Pacific, reported in the Railroad Gazette of Nov. 20, again discusses the extent of the power of the Commission to regulate freight rates, but the question is still left in the same unsatisfactory condition as before. Judge Sage confines his inquiry to the same narrow lines that have been adopted by the other courts; and the Commissioners seem to have before them a tedious contest to get an authoritative settlement of the question whether, in deciding that a certain rate is unreasonable, they have the right to say how unreasonable it is.

Judge Sage quotes from the decision of the Supreme Court in the Social Circle case (162 U. S., 196) the following paragraph:

"It was argued on behalf of the commission that the power to pass upon the reasonableness of existing rates implies a right to prescribe rates. This is not necessarily so. The reasonableness of the rate, in a given case, depends on the facts, and the function of the commission is to consider these facts and give them their proper weight. If the commission, instead of withholding judgment in such a matter until an issue shall be made and the facts found, itself fixes a rate, that rate is prejudged by the commission to be reasonable."

But the Commissioners will argue, of course, that they do not prejudice cases; that neither in this case nor even in cases where, as in the Missouri River grain-rate case in 1890, they have prescribed rates practically on their own motion, or on very vague complaint, have they prejudged. They have always held an investigation, more or less thorough.

The Supreme Court seems to ignore the fact that the Commission can itself "make an issue." It can itself enter a complaint before itself, and then become judge and decide the case. This combination of functions is, indeed, inconsistent with all the ancient traditions of the legal mind, and the courts, always conservative and always taking care to narrow down a question of this kind just as far as they can before uttering an opinion upon it, are likely to avoid, as long as possible, giving any opinion which will strengthen the hands of the commission. The Commissioners will, therefore, find their most hopeful field in Congress. That body, if it can authorize a commission to meddle with rates at all, can, we should suppose, prescribe limits within which the power may be exercised.

Whether Congress will do anything is another question. The transportation bills already before it seem to be still kept in the background by the same discouraging conditions that have prevented progress for the past year or two. Meantime one judge after another quotes with approval the dictum of the late Judge Jackson in the Baltimore & Ohio party-rate case (in August, 1890), a dictum which frowns severely on the theory that the State can rightfully prescribe transportation rates. In that decision Judge Jackson seems to have crystallized much of the opinion of his brethren on the bench. He said:

"Subject to the two leading prohibitions that their charges shall not be unjust or unreasonable, and that they shall not unjustly discriminate, so as to give undue preference or disadvantage to persons or traffic similarly circumstanced, the Act to regulate commerce leaves common carriers as they were at the common law, free to make special contracts looking to the increase of their business, to classify their traffic, to adjust and apportion their rates so as to meet the necessities of commerce, and generally to manage their important interests upon the same principles which are regarded as sound, and adopted in other trades and pursuits."

This view of the law has been followed by Judge Clark in Interstate Commerce Commission v. Louisville & (73 Fed. Rep., 409); by Judge Acheson in same v. Lehigh Valley; by Judge Simonton in same v. Northeastern (74 Fed. Rep., 70); and by Judge Bruce in same v. Alabama Midland (74 Fed. Rep., 715-733).

The Development of Tunnel Shields.

The death of Mr. Greathead has given occasion to writers in the popular and in the technical press to speak of the "Greathead system" of deep tunneling, and it is apparent that there is a good deal of confusion concerning the origin of the method of tunneling with shields as it is now developed. For that reason it has seemed well to give a condensed statement of the development of the tunnel shield. It is no part of our purpose to attempt to detract in any way from the just fame of Mr. Greathead. He was an able man, and he seemed to us a modest and a sincere man, and he deserved all the glory that he got in the world. At the same time it is only just to others that their

share in this particular branch of engineering should be recognized, and to that end the following facts have been collected.

The characteristic feature of the tunnel shield is the envelope extending back from the transverse bulkhead or face to lap over the end of the completed portion of the tunnel. This feature is first fully developed in the patent of 1818 to Sir Marc Isambard Brunel, which describes a circular shield, moved forward by hydraulic presses and covering a tunnel formed of cast-iron rings. His methods of excavation appear to us now more curious than practical. The Thames tunnel (1825 to 1842) was built with a square shield, in appearance unlike the modern shield, but containing the essential principle.

The Tower Subway under the Thames, a cylinder of 7 ft. exterior diameter, was built by Peter Henry Barlow in 1869. The shield was moved forward by screws after the men, working in front of it, had excavated the dry London clay nearly to full dimensions, leaving only a thin paring to be taken off by the cutting edge of the shield as it moved forward. Cast-iron lining was first used on the Thames Subway. The work was executed by Mr. Greathead as contractor.

In 1870 a shield was patented and built by Alfred E. Beach to excavate a small tunnel under the streets of New York. It was intended to work in dry sand, and was divided by horizontal shelves wide enough to take the natural slope of the sand for the height between the shelves. It was made of wood, with a cutting edge of iron, and was pushed forward by hydraulic presses, which were here first used for this purpose. But little work was done with it in New York, but a considerable length was built in Cincinnati with a similar shield.

In 1879 Leopold Taskin, of Jemappes, Belgium, patented in the United States the most important addition to the shield that has yet been made. The face of the shield is solid for about half its height. The lower half is cut away. From the bottom of the shield an inclined plane extends upward and backward an angle of 45 deg. to a height somewhat greater than the top of the opening. Air of sufficient pressure being used in the heading, this arrangement forms a complete air seal to prevent the entrance of fluid matter. This principle was applied to the pockets in the Hudson Tunnel shield. This it was which made successful the shield designed by Baker for the Vyrnwy-Mersey Tunnel, and this is the principle of the hanging curtains in the Blackwall shield.

Mr. Crawford Barlow claims that in the sixties his father patented a shield to be used with compressed air, and containing this air-seal; but as the patent is not known it has been suggested that only the preliminary steps were taken. Sir Benj. Baker designed a shield for the Humber Tunnel in 1873, containing this air seal, but the design was never published. The published project of Fowler and Baker for the Humber Tunnel was a tunnel built by means of caissons.

Mr. Greathead also, it seems, designed for the Woolwich Subway in 1876, a shield containing the air seal, the hydraulic press, and the segment erector. but as the work was not executed, nor were the drawings published, Taskin seems to have been the first to publish the air-seal principle.

In 1886 Mr. Greathead commenced the City & South London Railway, consisting of a pair of tunnels about 11 ft. in outside diameter, which were carried forward by means of a shield, much better studied and adapted to its work than any which had preceded it. In the London clay the men worked in front of the shield, as in the Barlow tunnel. At one point, however, it became necessary to build an air-lock and introduce compressed air. The annular space outside the cast-iron tunnel left in the stiff material by the larger shield was here for the first time filled with grout injected through holes in the lining. The work was rapidly and successfully executed.

In 1888 the Grand Trunk Railway of Canada, Sir Henry Tyler President, decided to construct a tunnel under the St. Clair River, at Sarnia. The material was the soft blue clay of the lakes, which had years before defied Mr. Chesborough's efforts at Detroit. The shield, of 21 ft. outside diameter, was carefully designed, and constructed without a contractor, by Mr. Joseph Hobson, Chief Engineer. The work was far more difficult and more important than anything of the kind before attempted (excepting only the Brunel-Thames tunnel), but by the use of the best materials, the best workmanship and careful attention, it was successfully and promptly executed.

The shield of the Hudson tunnel, designed by Sir Benjamin Baker and Mr. Greathead, was more elaborate than any of its predecessors—always excepting the original of Brunel, which stands alone. The bulkheads were double and the space was divided into pockets, furnished with the air seal before described.

In practice, however, the hanging plates on the outside were taken off, and the silt was permitted to squeeze through the openings as the shield was pushed forward.

A great number of small tunnels have recently been designed or built by means of shields, these latter varying much in details, according to the conditions of the case or the caprice of the designer. They are usually some modification of the City & South London Railway shield.

The latest, the largest and the most difficult of the sub-aqueous tunnels is that under the Thames at Blackwall, carried out by means of the most complete and most complicated shield yet designed, the work of Sir B. Baker and Mr. Greathead.

To conclude, the Brunel patent of 1818 "contained not the germ only, but all the important features of the modern shield." Its first successor was a very crude affair, which has been successively improved until it would seem that adaptation only and not improvement remained for the tunnel engineer.

The Right to Furnish Repair Parts.

A decision of considerable importance has recently been made in the United States Circuit Court of Appeals, Eighth District, in the case of the St. Louis Car Coupler Co. against Shickle, Harrison & Howard Iron Co., of St. Louis. The case was an appeal by Shickle, Harrison & Howard, the defendants in the original suit becoming the appellants later. The decision helps to make clear the law as to the manufacture of parts of a patented combination for purposes of repairs. It does not lay down any new principles, but illustrates established principles by the application to a special case.

The St. Louis Car Coupler Co. sued the Shickle, Harrison & Howard Iron Co. for infringement of patents, the act of infringement being in the manufacture and sale of knuckles to replace worn-out or broken knuckles. The Circuit Court of the United States for the Eastern District of St. Louis gave a decision in favor of the St. Louis Car Coupler Company. This is reversed by the Court of Appeals with directions to dismiss the bill of complaint at the complainant's cost.

The patents on which the suit was brought cover a combination of the drawhead, the knuckle, the pivot pin and the locking pin. No one part or element is claimed by itself as a new article of manufacture, but each claim is founded upon a combination of three or more of the aforesaid elements. The proof at the trial did not show that the defendant (Shickle, Harrison & Howard) had either made, or sold or offered to sell the complete coupler; they had made and sold the knuckle, and it is the manufacture and sale of the knuckle alone which is claimed as an infringement of the patent. It must always be borne in mind that the knuckle, by itself, is not patented.

The circumstances under which these knuckles were sold are that the defendant at one time made the entire coupler under contract with the complainant. After this contract had expired, and the defendant had ceased to make the entire coupler, it did continue to make, and at various times sold to railroad companies certain knuckles to take the place of knuckles that had been broken. The question to be determined, therefore, is whether making and selling knuckles for the sole purpose of repairing broken couplers, to persons who had previously purchased such couplers, and who were entitled to use them, constitutes in law an infringement of the patents. The decision turns on the further inquiry whether the purchase of the new knuckles and their use in place of worn-out or broken knuckles amounts to a reconstruction, or a repair, of couplers in use. If the purchaser had the right to repair couplers to the extent of replacing knuckles that had been broken it is obvious that he had the right to employ the defendant to make knuckles for that purpose, and the defendant incurred no liability in so doing.

The rule of law is well established that the owner of a machine consisting of several distinct parts, which, as a whole, is covered by patent, has the right to repair a part of that machine, provided the machine as a whole still retains its identity, and that such repair for the purpose of making the machine operative does not amount to reconstruction, and provided further that the parts so replaced are not separately covered by a patent. When a patented machine is accidentally destroyed, or when it is practically worn out, the owner cannot make a new machine under guise of repairing it. In such a case he must cast it aside and buy a new one from the patentee. It is not always easy to determine whether the replacement of a part should be regarded as a reconstruction of the machine or simply as a repair, and this is true, in a measure, of the case in hand. The question is not altogether free from doubt.

The Circuit Court concluded that the substitution of a new knuckle for one that had been broken should be regarded a reconstruction of the car coupler rather than as a repair. But this view followed from the theory that the knuckle is the chief element of the patented combination, is unique in form and structure, and is only susceptible of use in connection with the other elements of the complainant's coupler. The Court of Appeals

holds that the knuckle is much more liable to be broken than other parts of the complete device; that it will be broken frequently while the drawhead, remains intact; that, therefore, it is less durable than other parts of the coupler. Moreover, the drawheads, besides being more durable than the knuckle, are also an essential part of the patented combination. It is not accurate to say that the knuckle is the chief element. These drawheads are not like the drawheads in use in the ordinary coupler, but are of peculiar design to fit or complement the knuckle and make it operative. Neither is the knuckle the only part which affords evidence of invention, for that is found in the conception of the coupler as a whole.

In view of all this the Court holds that the purchaser of this coupler should have the right to replace a broken knuckle without the payment of an additional royalty, provided the drawhead remains intact and serviceable. It can hardly be supposed that a railroad company would equip its cars with a coupling apparatus one part whereof is liable to be broken long before the drawhead is worn out, unless on the implied understanding that the purchaser should have the right to replace that part, if accidentally broken, without being obliged to pay further tribute to the owner of the patent. The Court cites a number of cases as establishing the law in this respect; that is, as establishing the principle that the purchaser acquires a right to replace a knuckle which happens to be broken, provided the drawhead remains serviceable, and to that end the purchaser may either make a knuckle or buy it of someone else.

But this right must be confined within the limits stated. The defendant company would not have the right to make the knuckles which form a part of the complainant's device and to sell them indiscriminately. The defendant would be liable as an infringer if the knuckles made and sold by it should be used by purchasers in the construction of complete couplers, and so it becomes the defendant's duty to see that knuckles made and sold by it are sold for the purpose of repairing the coupler to persons who have acquired the right to make and use knuckles for such a purpose. The testimony does not show that any sales had been made by the defendant company, except to railroad companies that had previously bought the complainant's coupler, and that they were therefore entitled to use it. The testimony further does not show that the knuckles so bought were used for other purposes than to repair couplers in use. This strikes us that in this case the principles underlying the law are very simply laid down by the Court.

Mr. Little's Report on the Baltimore & Ohio Accounts.

Mr. Stephen Little's report on the finances of the Baltimore & Ohio Railroad, made at the request of the New York Reorganization Committee, has just been published, although dated July 11. The investigation covered the accounts from September, 1888, to Nov. 30, 1895. It therefore coincides with the period from the time when the control of the road passed from the hands of Mr. Spencer until it was delivered over to Receivers. There was no need of going back of 1888, because in that year Mr. Spencer carefully revised the accounting methods and put them upon a basis which if continued would have given the public a series of full and straight forward statements, and would have prevented any occasion arising for such a statement as Mr. Little has made.

The report is a voluminous document, and presents instances of remarkable bookkeeping, similar in many respects to those Mr. Little has been called upon to record in other investigations of the finances of great roads forced into insolvency. The great errors in accounting Mr. Little groups under six heads thus: Overstatement of net income; mischarge of worn-out equipment to profit and loss, instead of to income; capitalization of charges to income; capitalization of so-called improvements and betterments of subsidiary roads; payment of unearned dividends; under statement of liabilities. The amounts under each of the several heads are large. Thus, taking together the first four groups, the total discrepancy in the income account as presented by Mr. Little, and in the statements as issued by the company, is no less than \$11,204,859.

These sections of the report might be recapitulated as below:

Suspended expenses.....	\$211,864
Fixed charges not paid.....	161,272
Car repairs not charged to expenses.....	184,762
Wrong charges to profit and loss.....	116,468
Assets written up in value, uncollectible assets and wrong credits to income.....	\$2,016,702
Depreciation of equipment chargeable to profit and loss instead of income.....	2,843,506
Improvements on main and leased roads, chargeable to income.....	5,640,155
	\$11,204,859

A few instances will suffice to illustrate some of the methods practised. In 1892 the value of the Western Union stock was "written up" \$468,038, and stock of another company, \$114,300. That is, they were credited with this amount above their book value. About \$750,000 advanced to controlled roads, and which can never be paid, was entered as a credit; and charges against operating expenses were entered in the profit and loss account.

Going to the next account, unearned dividends, Mr. Little recapitulates the dividends on common stock paid in the period under review. There were several cash dividends amounting altogether to \$3,312,-

087, following the stock dividend of 20 per cent. \$2,956,920 declared in 1891, the total dividend payments thus being \$6,269,008. But of this amount Mr. Little declares only \$971,447 to have been earned. Mr. Little charges a good many items to income, which are not usually so charged, and which perhaps may be quite properly charged to capital. Even including these various amounts the full charges have been met and all the preferred dividends fairly earned (taking the period as a whole, not if each year is considered separately) with a balance of nearly a million dollars remaining to the good. That is a fact of importance which it was well worth while to bring out. Averaging the results over the whole period, as Mr. Little does in his tables, it is shown [that the company could claim a surplus of \$136,550 each year after paying \$300,000 for the regular dividends on the preferred stock. What the present condition of the property would have been if it had been governed by a policy which would have been content with the results here shown and used the surplus for improvements instead of paying unearned dividends is now a useless speculation.

Under Mr. Little's sixth heading, the under statement of liabilities, he sums up the total floating debt as \$15,212,000. In arriving at this figure, he deducts over 4½ million dollars, representing offsets believed to be good, but not deducting stocks and bonds owned which could be used as an offset. Of this amount \$5,481,835 is indebtedness not before acknowledged, representing chiefly the company's endorsements of the notes of its subsidiary roads. The floating debt as stated includes \$2,910,000 of equipment trusts, secured by the equipment.

Contrasting the balance sheets of Sept. 30, 1888, and Nov. 30, 1895, the latter shows a net increase in liabilities of \$22,180,000. This does not take into account the company's liability for its endorsements just noted. In spite of this great increase in capital liabilities the earning capacity of the property was much less in 1895 than in 1888. In the earlier year (to Sept. 30) net earnings from traffic were \$5,749,277 and from all sources \$6,956,238. In the year to June 30 net traffic earnings were \$5,186,985 and total net earnings were \$6,494,580, according to Mr. Little's revisions. The loss, therefore, was \$461,657.

This showing Mr. Little considers very positive proof in itself of excessive charges to capital account. Mr. Little concludes that \$2,064,000, charged to capital for improvements on the main stem, are not properly so charged, and that \$3,575,000 for improvements and betterments on controlled roads should also be charged against income, or \$5,640,000 altogether, as shown in the table above. This part of his report, however, is not so satisfactory as it might be, and fails in clearness and completeness. He seldom gives the items which he thinks were improperly charged to capital, but only the amounts chargeable against each of the subsidiary companies. Where there is such divergent opinion among railroad officers and accountants on the subject of capitalization of improvements, Mr. Little would have done well to have pointed out the various items which he believes should be charged against income. Presumably he would not favor the practice, not uncommon, where the revenue will not go very far in paying for improvements, of charging capital with the increased cost of new rails of a heavier section than those replaced, over what it would have cost to put down new rails of the old section. But Mr. Little's readers ought at least to know this, and to be able to judge how much farther he carries his ideas on this subject.

But whatever room there may be on this point for difference of opinion, there can be none as to the impropriety of two other accounts which Mr. Little looked into. These are the general adjustment and securities adjustment accounts. Briefly, they were used to conceal the over-statement of net income made in the reports by writing up the book values of assets and including advances to other companies. The first of these accounts was charged altogether on the company's books with \$2,474,000, and the second account with \$300,000. Of the first account Mr. Little transfers 1½ millions to profit and loss, and \$203,000 of the second. The balance remaining is carried to various other accounts, and the two named disappear altogether.

A supplemental report takes up the leased lines, but little more than the balance sheet of each line is given.

Australian Railroads.

Australia, like this country, has been passing through a period of depression, which is reflected in decreased earnings by the railroads of the various colonies. The reports of the Railroad Commissioners of New South Wales, Queensland, Victoria and South Australia, for the year ending June 30, 1896, have now all been issued, and the results of the year's workings are therefore available.

Taking the returns of the four colonies together, the gross earnings, as compared with 1895, have decreased from £7,496,000 to £7,261,000. Net earnings fell off only slightly more than gross, and the increase in the deficit is £240,000. The total deficiency to be made good out of the revenue of the colonies, is £1,106,000.

The year's results have been affected by a number of adverse circumstances, causing heavy decrease in traffic, so that no progress in wiping out the yearly deficit was expected. Drought is estimated to have caused the loss of 13 million sheep and lambs in New South Wales and 4 millions in Queensland. Agriculture has been depressed and here the loss to the railroads will

* Alexander Binnie, Esq., Engineer London County Council, Chief Engineer Blackwall tunnel; in Proceedings Institution of Civil Engineers.

extend into another year. The shortage of the wheat crop has been great enough to induce some imports from this country. There have also been labor troubles and financial stringency in some of the colonies to add to the troubles of the railroad administrations. In view of the unusual traffic conditions which have had to be met the results reported are not to be regarded as wholly unfavorable.

The capital expenditures for railroad construction in the four colonies have been £107,357,000, on which the interest is £4,041,000, about 3.764 per cent. Net earnings were £2,935,000, equal to 2.734 per cent. on the capital, the resulting deficiency in meeting the fixed charges figuring out 1.030 per cent. The ratio of working expenses was 59.5 per cent. There has been a steady decrease in the percentage of earnings absorbed by working charges, in recent years, except in Victoria. There the percentage, which was 59.9 in 1894, was 64.4 in 1896. It compares with a percentage of 55.0 in New South Wales, its aggressive and powerful neighbor.

Indeed, by including the earnings of the Victorian railroads, the total is materially changed for the worse. The railroads of Queensland and South Australia earned more and had smaller deficits than in 1895, and in New South Wales the deficit was only £169,000. In Victoria the comparisons are unfavorable in all items. That colony, a few years ago, entered upon an extravagant policy of railroad expansion, which has added a further heavy burden to its finances, and has rapidly increased the yearly deficit in working the railroads. Most of the cost of the extensions was charged to capital before 1894, but in that year the deficit was £370,000, and in 1896 it had grown to £583,000, more than half the total deficit reported by the four colonies. But the Victorian railroads contribute only about one-third of either the mileage or gross earnings of the four colonies. The aggregate of the deficit in this one colony, for seven years, is now about \$13,000,000.

The main results for each of the colonies are given in the *London Economist*, and are republished below:

New South Wales.			
	1896.	1895.	1894.
Gross earn.....	\$2,820,417	\$2,878,204	\$2,815,541
Per cent. of working exp....	55.02	54.40	56.58
Net earn.....	\$1,268,529	\$1,310,615	\$1,221,699
Deficit.....	109,006	48,184	118,045

Victoria.			
	1896.	1895.	1894.
Gross earn.....	\$2,401,392	\$2,581,591	\$2,726,159
Per cent. of working exp....	61.40	59.78	59.59
Net earn.....	\$854,917	\$1,038,198	\$1,060,740
Deficit.....	588,686	380,649	70,109

Queensland.			
	1896.	1895.	1894.
Gross earn.....	\$1,052,691	\$977,289	\$931,053
Per cent. of working exp....	61.21	59.80	61.27
Net earn.....	\$408,330	\$393,811	\$332,650
Deficit.....	348,214	364,199	420,426

South Australia.			
	1896.	1895.	1894.
Gross earn.....	\$986,500	\$960,195	\$997,707
Per cent. of working exp....	59.10	59.26	57.97
Net earn.....	\$403,478	\$391,182	\$430,115
Deficit.....	64,896	75,503	32,873

The total losses for the three years to be made good out of general revenue have been as follows: Victoria, £1,334,444; Queensland, £1,132,839; New South Wales, £275,185; South Australia, £173,278.

Railroad building in Australia, though under restrictions not existing in this country, has been carried on beyond the needs of the country, and the heavy charges which the newer lines have added to the revenues have had the result of suspending new construction work almost entirely. At present but 60 miles of new road is building in the four colonies named. But 476 miles has been added to the operated mileage since 1893, while in the three years before that date over 1,077 miles was built.

The cost of railroad construction to the different colonies and the increases in the capital expenditure in each of the last three years are given below:

Miles oper.		Capital expenditure		
		1895-6.	1896-7.	1897-8.
New South Wales ..	2,531	\$37,922,207	\$36,611,366	\$35,855,271
Victoria.....	3,121	38,108,151	37,922,207	37,748,568
Queensland.....	2,386	18,745,488	18,482,736	18,376,678
South Australia.....	1,722	12,883,443	12,520,378	12,154,417
Total.....	9,760	\$107,357,289	\$105,536,687	\$104,134,299

The Report on Maximum Dimensions of Freight Cars.

The committee from the Trunk Lines and the Central Traffic and Western Freight associations, which was appointed in November, 1894, to consider the question of maximum dimensions of freight cars, has just completed its work and made its report. The subject was first brought up at the conference in New York at which the mileage of interchanged cars was fixed at six miles a mile. The committee met in Chicago in January of last year and directed the chairmen of the Central Traffic and Western Freight associations to ascertain precise details pertaining to the equipment of the various roads, also information concerning obstructions to be encountered from tunnels, bridges, station platforms, etc. This data, when procured, was submitted to a sub-committee of mechanical superintendents which later made a report to the general committee.

The joint committee consists of C. H. Chappell, C. & A.; Wm. Greene, B. & O.; C. M. Hays, G. T.; H. B. Ledyard, Mich. Cent.; Jas. McCrea, Penn. Co.; C. E. Pugh, Penn. R. R.; Jos. Ramsey, Jr., Wabash; E. B. Thomas, Erie; W. H. Truesdale, C. & P.; C. G. Warner, Mo. Pac. Its report is addressed to the Chairman of the respective associations and is as follows:

In pursuance of action taken by your respective associations in the years 1894 and 1895, by which this committee was appointed to consider the subject of "maximum dimensions of freight car equipment, which

shall not be exceeded in future construction," your committee beg to report that they have given the subject careful consideration, held several joint meetings, in addition thereto called to their aid a committee of mechanical experts from lines represented in the associations, and have obtained from them a very full report, following their investigations and deliberations.

Your committee finds no difficulty in reaching the conclusion that the remedy for the evils from which we now suffer by reason of the varied sizes and capacities of freight cars, and the tendency to increase dimensions and depart from uniformity, rather than adopt practices tending to uniformity, must be applied by the traffic officers through classifications and minimums. And your committee earnestly urge that the respective associations take such action as will bring about a material modification of the existing practice, to the end that such minimums may be established as will equitably adapt themselves to the different capacities of the cars now in service. We feel that better immediate results may be accomplished in this direction than in any other.

Your committee is of the opinion that, from the standpoint of economical construction, maintenance and operation, the length of box, stock, refrigerator, gondola and flat cars should not exceed 35 ft. outside the body; but as there are now in service a considerable number of cars larger than this, we have concluded to suggest the following dimensions as those which shall not be exceeded in the future construction of freight cars:

Length outside of sheathing or box.....	37 ft. 0 in.
Width.....	9 " 1 "
Width outside of eaves.....	9 " 7 "
Height from bottom of sheathing to top of eaves.....	9 " 0 "
Height from top of rail to top of eaves.....	12 " 3 "

We further recommend that all roads be earnestly requested to discourage the building of cars of large dimensions by private ownership.

The committee was divided on the question of the proper length for furniture cars, and a minority report was presented recommending that the length of this class of cars be 40 ft.; other dimensions to be the same as proposed in the majority report. The members of the committee who favored the majority report expressed a fear that if the length of furniture cars was fixed at 40 ft. the result might be that these cars would be used for miscellaneous traffic, although classified as furniture cars.

Lines representing a majority (in mileage) of the Western Freight Association have already voted in favor of the adoption of the report, and meetings will be held as soon as practicable in each association to vote upon the adoption or rejection of the report and to set a date when it shall be made effective if adopted.

The development of the mining industries in South Africa has had a very favorable effect on the traffic of the railroads in Cape Colony, in which, however, the mines are not situated. The railroad system of the Colony has remained unchanged since 1892, amounting to 2,253 miles; but the number of passengers increased 26 per cent., the tons of freight 34 per cent., the gross earnings 32½ per cent., and the net earnings no less than 75 per cent. from 1893 to 1895. Last year the net earnings were 7½ per cent. on the capital invested. The rates have been very high, and it is now proposed to reduce them for the longer distances. The Cape railroads have used English coal, but are now getting part of their supply from domestic mines, which supplied them nearly 200,000 tons in 1895. The English coal that year cost \$6.66 per ton at the Cape, while the larger part of the native coal was had for \$2.40 and the rest for \$3.60 per ton. In the Colony of Natal, a little north of Cape Colony, the railroads formerly had the bulk of the traffic of the South African Republic, to and from the sea. By the end of 1892, a connection of the Cape railroads to Johannesburg took most of this traffic from Natal, and the effect on its railroads is shown by the course of their gross earnings in successive years, as given below in pounds sterling:

	1890.	1891.	1892.	1893.	1894.	1895.
	606,713	572,296	532,788	416,614	463,872	526,494

There were but 285 miles of railroad in 1890; in 1893, 399, last year 401. Natal now has a connection of its own with Johannesburg, and is getting a share of the traffic. The net earnings of the Natal railroads were a little more than four per cent. on the capital last year, and barely 2½ per cent. in 1894.

At a recent meeting of managers of Western roads there was some discussion regarding the desirability of regulating the loading of freight cars so as to secure better economy. The question of the use of private cars was also once more taken up and as a result of the meeting the Chairman of the Western Freight Association was directed to call a meeting at an early day for "the adoption of rules to compel the loading of all freight equipment to within 10 per cent. of the marked capacity of the car" and "the adoption of measures looking to the more constant use of equipment owned by the railroad companies and the consequent displacement of private cars." That is a pretty big contract, but we wish our Western friends success. "Displacement of Private Cars" involves two reforms. First, the railroad companies must make their own cars fully as desirable as any others, in every detail, including care and attendance. Second, the payment of car hire must be totally divorced from rate-making. When a freight agent desires and determines to charge the same rates to all shippers, whether they own cars or not, he will very soon be ready to "displace" private cars, unless he or his friends own a share in them. The resolution concerning the loading of cars to their full capacity chiefly refers, of course, to bulk freight. With the wide variety of car capacities now in use, the wasteful use of cars must be very common, though we have no definite information on the subject. To a shipper com-

monly loading 15 tons to the car, 20 tons seems an excessive load, and if not corrected he may be guided too much by habit. If the car will carry 25 or 30 tons he will be greatly underloading when he thinks he is overloading. If his loading facilities are such as to necessitate extra work in stowing the last 10 tons of a 30-ton load, he will of course evade the task if he can.

The Central Passenger Committee has finally compromised with the Commercial Travelers' Association, by granting to such of the roads, members of the Association, as desire to do so, permission to issue an interchangeable 5,000-mile ticket at 2 cents a mile. It is reported that the Pennsylvania has asked for authority to issue (west of Pittsburgh) in connection with various other roads, said to number twenty or more, an interchangeable 5,000-mile ticket, which is to be sold at \$150, with a rebate of \$50 when the cover is returned. The ticket is to have an identification form attached and the coupons are to be exchanged for card tickets at the various local ticket offices, such card tickets to be of special form and to be reported to the Commissioner of the Association. This action of the Pennsylvania, coupled with the reported similar action on the part of the Big Four, is likely to lead to the issue of such tickets generally throughout the Central Passenger Association territory. The practice would also be likely to spread to Western Passenger Association territory, as the Wabash has given notice that if it is compelled to issue a 5,000-mile ticket it will make it good over all its lines, which will carry it into Western territory. A meeting of lines west of Chicago was held in that city on Tuesday of this week, but no agreement was reached, there being strong opposition to the interchangeable ticket.

NEW PUBLICATIONS.

Western Society of Engineers.—The fifth number of the *Journal of the Western Society of Engineers* has just been issued. "Notes on Bedford Stone and Louisville Cement," compiled from various sources by the Publication Committee, are illustrated by 28 engravings from photographs taken at the time of the excursion of the society to these quarries; and, beside containing much valuable information in a condensed form, they make a permanent record of a very pleasant trip. This number also contains papers and discussions on the following subjects: "Parks and Roads," by Mr. J. F. Foster, Superintendent of South Park, Chicago; "Parks and Park Roads," by Mr. H. C. Alexander, Superintendent Lincoln Park, Chicago; "Steel for Boilers and Fireboxes," by Mr. I. L. Condron, Pittsburgh Testing Laboratory; "Terminal Yards," by Mr. H. G. Hetzler, Roadmaster C. & Q. R. R.

Beside the minutes of the meetings, abstracts from various publications are given under the following headings: "Cement versus Frost" and "Cement Tests," Transactions of Canadian Society of Civil Engineers; "Flow of Water in 48-inch Pipe," Proceedings American Society of Civil Engineers; "The Influence of Cold on the Strength of Iron and Steel" (foreign), "Electric Industry in the United States," "Artificial Fuel," and "Hydraulic Dredging," *Cassier's Magazine*.

Transactions of the American Society of Mechanical Engineers. Volume 17, 1896. Prof. F. R. Hutton, Secretary, 12 West Thirty-first street, New York City.

This volume contains the papers and discussions at the December, 1895, meeting in New York and at the May meeting in St. Louis, with memorial notices of deceased members, and an appendix on the fifth conference on methods of testing materials. The whole volume is 764 large octavo pages with an excellent index and table of contents. There are something more than 30 different papers with their discussions, and it would be quite impracticable, as well as unnecessary, to make any specific notice of them, as they have already been treated at more or less length in these columns.

TRADE CATALOGUES.

The Brown & Sharpe Mfg. Co., of Providence, R. I., has recently issued new editions of "Formulas in Gearing" and "Practical Treatise on Gearing," and has endeavored to improve and add to them so that now they include much valuable information, obtained by recent investigation, not heretofore published. The "Practical Treatise on Gearing" has 156 pages. Price, cloth, \$1; cardboard, 75 cents. The "Formulas in Gearing" has 82 pages. Price, cloth, \$2. This work supplements the "Practical Treatise on Gearing" and contains, condensed as much as possible, the solution of all problems in gearing which in the ordinary practice may be met with, to the exclusion of problems dealing with transmission of power and strength of gearing. The symbolic expression has been resorted to whenever available.

TECHNICAL.

Manufacturing and Business.

The New York Belting & Packing Co., Limited, will open a large store at 143 Lake street, Chicago, under its own management, about Dec. 15. This will serve as a warehouse for the distribution of the company's rubber goods throughout the West and Northwest and will make possible more prompt deliveries than heretofore.

The Milwaukee Automatic Car Coupler Co. has been

organized in Milwaukee to make the Runkel conpler, the invention of John P. Runkel, of Milwaukee.

The Missouri Malleable Iron Co., of East St. Louis, has begun work on an addition to its annealing-room, and intends putting in additional ovens to increase its capacity one-third. It has closed a contract with the Trojan Car Coupler Co. for from 35,000 to 50,000 "Trojan" couplers.

The rail mill of the Pueblo Steel Works, Colorado Fuel & Iron Co., is now at work on an order of 60-lb. rails for the Colorado Midland. After this order is finished, the 12,000 tons of 75-lb. rails recently ordered by the Gulf, Colorado & Santa Fe will be rolled.

The Newton Machine Tool Works, of Philadelphia, has an order from a South American railroad for heavy milling machine equipment, including rod-milling machines, plain-milling machines and vertical rotary planers.

The Penn Steel Casting & Machine Co., of Chester, Pa., has recently completed a number of castings for barbettes and disappearing carriages, which are being built at the Watertown arsenal, and for a 12-in. disappearing carriage about to be built at Stamford, Conn., for the Ordnance Department, U. S. A.

Work on the new beam mill of the Cambria Iron Co., Johnstown, Pa., which was begun some six months ago, is now being pushed rapidly, and it is expected that the mill will be running in a few weeks. The company will then be in the market for the sale of all sizes of I-beams and other structural products. The open-hearth plant of the company is also being enlarged.

The New England Steel Co. has been incorporated at Camden, N. J., with a capital stock of \$100,000, to make iron castings and to deal in iron and steel. The incorporators are Henry T. Kent, W. C. Henderson, N. S. Keay and Aaron Hamburger, of Philadelphia; H. A. Williams, of Massachusetts, and George W. Ring, of East Orange, N. J.

The greater part of the plant of the Brown-Bonnell Iron Co., at Youngstown, O., has been started up. Fires have been lighted in the following departments: Nos. 3 and 4 puddle mills, No. 3 bar mill, Williams' bar mill, Williams' guide mill, link and pin factory, No. 2 scrap furnace and the sheet mill.

The Sharon Iron Co.'s furnace was put in blast on Dec. 1, after an idleness of several months. This gives employment to about 125 men. The furnace has been completely repaired while lying idle.

The Carnegie Steel Co. has recently shipped from Pittsburgh 20 carloads of channel bars, bands and I-beams to Cramp & Sons, Philadelphia.

Iron and Steel.

Furnace men of Birmingham, Ala., report still further sales of pig iron to foreign buyers. The Tennessee Coal, Iron & Railroad Co. has shipped 2,500 tons to Liverpool, and has inquiries for prices on an aggregate of 20,000 tons from Rotterdam and other European points. The Sloss Iron & Steel Co. has an order for 3,000 tons from Calcutta and the same buyer wants quotations on 3,000 tons more.

New Stations and Shops.

The new union station at Jacksonville, Fla., is nearly completed, and will be ready for occupancy in a few weeks. The station is a two-story building, 360 ft. x 130 ft. It is built entirely of brick. The general waiting-room, ticket offices, and baggage-room will be on the first floor, the second floor being used for the railroad offices. The contract for the building was let to S. S. Leonard, of Pensacola, and the approximate cost, including foundations, will be \$58,000.

The Central Railroad of New Jersey has authorized the construction of a combined passenger and freight station at Chatsworth, N. J. to cost \$2,000.

Loading Logs and Long Material.

The Committee of the Master Car Builders' Association has sent out the following circular of inquiry:

The Committee on Loading Logs, Poles, Bark and Long Structural Materials on Cars would respectfully ask that each member of the association advise it as to whether the rules as adopted last June are satisfactory, and if not, what improvements could be made or what additional rules are required. The committee would state that there have been some replies, in answer to informal inquiries, to the effect that the loading of pipe, cordwood, ties and tanbark should be mentioned; also, that some suggestions have been made in regard to loading long logs, but these suggestions are not different in any essential particular from the recommended practice under general instructions, paragraph No. 3, for round timber. Reply should be sent to P. Leeds, Chairman of the Committee, Louisville, Ky.

A Grease Lubricant Used on Signaling Apparatus. A report of the Supervisor of Signals to the Engineer of Maintenance of Way, on a leading trunk line, given to the Joseph Dixon Crucible Co., shows excellent results from the use of Dixon's waterproof graphite grease. At one point, from Oct. 1st to Nov. 28th, 4 oz. of the grease was used on the locks, cranks and compensators outside and on the machine in the tower. The cost was found to be very little more than that of oil. The same test was made at another point on the road with the same good result. The Supervisor found the grease to be better than any other kind of lubricant, as it can be applied quickly and stays where it is put. It is also clean, and rain water has no effect upon it. The graphite used in the manufacture of the grease is Dixon's pure flake graphite, the lubricating qualities of which are well known; and its waterproof properties recommend it for bearings and exposed parts of railroad signals.

The Dynamic Effect in Boiler Explosions.

The *Bulletin de la Société Scientifique Industrielle de Marseille* for 1896 contains an article by Mr. P. Dubiau on the dynamic effects in boiler explosions. The author has investigated a large number of boiler explosions, and has come to the following conclusions: (a) Explosions are due either to the natural deterioration of the boilers or to faults in construction. (b) The steam pressure is never increased in a boiler otherwise than by the natural action of the furnace. (c) The action attributed to a superheating of the water or to a spheroidal state is not confirmed by any practical experience. (d) The explosion of a boiler is not an instantaneous effect. The rent commences at the point of least resistance and spreads to the neighboring parts only if the shell is not able to withstand the strain. (e) The number and directions of the rents depend on the resistance of the parts around this first fault. Even a large tear does not produce an explosion if the surrounding parts are sufficiently strong. (f) In an explosion the pressure of steam does not fall immediately a fracture occurs. With a small fracture, the pressure remains practically constant till all the water has left the boiler. (g) The destructive nature of explosion increases with the increase in the orifices caused by the fractures in the boiler shell made before the water has escaped. (h) There is no connection between boiler explosions and what is known as the spheroidal state.

An investigation of what happens when the first fracture occurs and of the effects of the position and magnitude of this first fracture gave the following conclusions: (1) Great dynamic effects are the result of an explosion in the interior of the boiler. In such explosions the fractures often take the line of greatest resistance and give fragments somewhat like broken pottery. (2) The interior explosion is caused by the energy given off when the surface of the heated water is suddenly exposed to a diminished pressure such as that of the atmosphere. (3) The instantaneous dynamic effects depend on the amount of the surface of water exposed. (4) With equal surfaces exposed the energy developed will be proportional to the volume in the boiler. (5) Fractures in the lower parts of the boiler and below the water line are only dangerous when there is an external resistance at the point of fracture. (6) Fractures in the steam spaces are the most dangerous, due to the fact that steam issues from an orifice much more quickly than water, and hence a more sudden diminution of pressure results.

"Rapid Transit" in Great Britain.

The elevated railroad in Liverpool has a moderate growth of traffic, the whole number of passengers having been 7,519,950 in the year ending with June last, against 7,101,439 the year before. The road issues first and second class and workmen's tickets. In the last half-year less than one-eighth of the passengers traveled first class, and 27 per cent. traveled on workmen's tickets. Dividends have been paid in successive half-years at the rate of 2 per cent., 2½, 3½ and 2½ per cent. per year, successively.

The underground railroad in Glasgow (the second city of Great Britain) opened Aug. 10, last, five years after it was begun, is seven miles long and has 12 stations. There are 74 trains daily in each direction, going most of the day at 15 minute intervals. The trains make the seven miles in 28 minutes, or at the rate of 15 miles an hour.

The Winterthur Locomotive Works.

The well-known locomotive works at Winterthur turned out its thousandth locomotive near the end of September. The works had just completed the 25th year of its activity. On this occasion the company gave 10,000 francs to the sick fund of its employees, and gave a 5 franc piece to every workman, with an additional franc for every year he had been working for the company. This company paid a dividend of 8½ per cent. for its last fiscal year, and had a comfortable surplus besides.

Two New Gunboats Launched.

The United States gunboats Vicksburg and Newport were launched at the Bath Iron Works, at Bath, Me., on Dec. 5. These gunboats are of what is known as composite construction, the entire frame of steel being planked below the water. The planking is covered with copper. The length over all is 200 ft., and 168 ft. between perpendiculars. The beam between moldings is 35 ft., 5 in. and extreme beam 36 ft. The mean draft is 12 ft. and the displacement 1,000 tons. The armament consists of six 4-in. rapid-fire breech-loading rifles, four 6-lb. rapid-fire guns, and two 1-pounders. The engine is vertical and triple expansion, with cylinders 16 in., 22 in. and 36 in. in diameter, with a 24-in. stroke. Its horse-power is 800, one half that of the Machias. The contract speed is 12 knots, with no premium for excess, but with penalty for falling short.

More Battleships Recommended.

Secretary Herbert in his annual report asks Congress at the coming session to authorize three light-draft battleships and 12 torpedo-boats. He recommends that the battleships be planned for an extreme deep load draft of not more than 23 ft. and suggests that considerations of strategy upon our Atlantic and Gulf coasts render this an essential to the success of naval campaigns. Battleships that could enter the harbors of Savannah, Brunswick, Key West, Tampa, Pensacola, Mobile and the mouth of the Mississippi at all times would have an immense advantage over the battleships of foreign nations, few if any, of which could enter these ports.

Contracts for Gun Forgings Awarded.

Secretary Lamont awarded contracts on Nov. 2 for 40 sets of gun forgings and 30 sets of mortar forgings to the Bethlehem and Midvale Steel companies. The Bethlehem Co. will make 10 sets of forgings for 5-in. siege guns and 10 sets for 7-in. howitzers at 27½ cents a pound. The Midvale Co. will make 20 sets of forgings for the 7-in. mortars at 31 cents a pound and 30 sets of forgings for the 3.2-in. field guns at 32 cents a pound.

A Large Steel Boiler Plate.

A steel boiler plate which is claimed to be the largest one made has been rolled recently at the Krupp Steel Works, at Essen, Germany. The plate is 39 ft. long, 11 ft. wide and 1½ in. thick; its weight is 37,600 lbs. A plate, rolled a short time ago by the Stockton Malleable Iron Co., England, was considerably longer than this, but its area was less, and its weight only 12,300 lbs.

A Tall Steel Chimney.

A steel chimney, 217 ft. high, has been completed at the Ridgewood pumping station in Brooklyn. The plates in the structure number 137; they vary in weight from 800 to 1,400 lbs., and in thickness from a quarter to half an inch. The chimney measures 20 ft. 7 in. at the base and tapers to 8 ft. at the top. The braces are on the inside, and consist of 205 iron rods ¾ in. in diameter and placed 12 in. apart. There is a filling-in of brick for a distance of 108 ft. from the base to prevent injury from heat. The foundation is 25 ft. square. On the concrete and brick foundation rest eight octagonal granite blocks weighing 6½ tons each, and on these is placed a circular bed-plate. The furnaces of 10 boilers of 250 H. P. each are to be connected with the chimney.

The Richmond Compound Locomotive.

The compound locomotive of the Richmond Locomotive Works, which has been tested on a number of roads, has just finished a service test on the Louisville & Nashville and goes on the Wabash at once for experimental runs between St. Louis and Decatur.

THE SCRAP HEAP.

Notes.

A bill has been introduced in the Georgia Legislature to strengthen the powers of the Railroad Commission in the matter of enforcing its decisions.

A freight-train crew was intimidated by a gang of 50 tramps near Wilmington, Del., last Saturday night, most of the tramps being armed. All but seven of them got away before the police arrived.

Under a decision of the United States Supreme Court, handed down last week, the Central Railroad of Georgia will have to pay taxes under the Georgia law of 1889. The road had contended that under its charter it was exempt from county and municipal taxation as prescribed by this law.

The mail cars on the Wabash Avenue Cable Railroad in Chicago will hereafter have grips of their own instead of being hauled as trailers by passenger cars. It is expected that this will prevent delays by more thoroughly impressing upon dilatory teamsters that in delaying a car they are violating an important law.

The Legislature of Vermont, which has just held its biennial session, passed a law providing for appeals from the decisions of the Railroad Commissioners in matters affecting grade crossings of one railroad by another. Any interested party, dissatisfied with a decision of the Commissioners, may apply to the Supreme Court, which shall, after notice, appoint three disinterested Commissioners to review the case. On a report from this commission the court may make any necessary orders, and, if a crossing is established, assess the cost of construction and maintenance upon the parties in interest, in equitable proportions.

Lake Superior Traffic.

This week the St. Mary's Falls Canals, at the foot of Lake Superior, have closed for the season. Their total traffic has been a little over 16,050,000 tons, an increase of over 1,200,000 tons over the year before. Despite the low freight-rates in force nearly all season which have made an average mile ton rate under any preceding season, even probably less than the .99 mill of 1894, the total freights paid on goods taken out of and into the lake have been some \$15,940,000. The increase in grain carried out of the lake amounted to 88,500,000 bushels, of which 63,000,000 were wheat. In this item alone there is an increase of nearly 1,200,000 tons over the preceding year. Iron ore has amounted to 7,952,000 tons, somewhat less than last year. Of coal 3,000,000 tons passed up; of lumber 690,000,000 ft.; of flour 8,650,000 bbls.; of refined copper 116,000 tons, valued at \$23,000,000, and of miscellaneous articles a quantity about as large as in the year before. It is probable that the total value of the traffic carried in the 7½ months of passage has been over \$200,000,000. Passenger traffic of the Lake Superior shipping has been about 40 per cent. larger than in any earlier year, footing up to 37,500 persons. In all 18,465 craft used the two canals during the season, or an average of 84 every 24 hours. Never before have so large cargoes been carried, those of wheat averaging nearly 70,000 bushels each, and those of ore 2,600 tons. The canals have given 16 ft. of water much of the year, enabling all cargo records to be broken.

The traffic of the past few decades has been: 1870, 690,870 tons; 1880, 1,734,890; 1890, 9,041,230; 1895, 15,062,000; 1896, 16,100,000.

The President on the Interstate Commerce Law.

The Interstate Commerce Commission has, during the last year, supplied abundant evidence of its usefulness and the importance of the work committed to its charge. Public transportation is a universal necessity, and the question of just and reasonable charges therefor has become of vital importance not only to shippers and carriers, but also to the vast multitude of producers and consumers. The justice and equity of the princi-

ples embodied in the existing law, passed for the purpose of regulating these charges, are everywhere conceded, and there appears to be no question that the policy thus entered upon has a permanent place in our legislation.

As the present statute when enacted was, in the nature of the case, more or less tentative and experimental, it was hardly expected to supply a complete and adequate system. While its wholesome effects are manifest and have amply justified its enactment, it is evident that all desired reforms in transportation methods have not been fully accomplished. In view of the judicial interpretation which some provisions of this statute have received and the defects disclosed by the efforts made for its enforcement, its revision and amendment appear to be essential to the end that it may more effectually reach the evils designed to be corrected. I hope the recommendations of the commission upon this subject will be promptly and favorably considered by the Congress.—*President's Message.*

Watch Inspection on the Houston & Texas Central.

The requirement that employees of this road should have their watches inspected every month was noted in the *Railroad Gazette* of Dec. 4. The chief watch inspector has since issued to employees a circular laying down the requirements which are to be enforced by his office. No engineer or conductor can have a certificate on his watch unless it is a stem winder and setter and has a Breguet hair-spring. It must be adjusted to heat, cold and position, and it should be equal to a B. W. Raymond (Elgin) or an Appleton & Tracy (Waltham). These grades of movements in a silverine open-face case will be furnished for \$18 to \$20; in a good 20 year filled open-face case from \$25 to \$30. No certificate will be given on a watch that is not at least equal to a new model G. M. Wheeler (Elgin) or P. S. Bartlett (Waltham). These movements in a silverine open-face case can be bought for \$12.50, and in a good 20-year filled case, open face, from \$17.50 to \$20. The Inspector recommends that all firemen and brakemen have good watches. No watch will be certified if it has not been cleaned and oiled within 12 months previous. The Inspector says: "Should I at any time find an employee on duty with a different watch from the one on which he got his certificate (and I am liable to be on the road any day) the fact will be at once reported to the head of the department in which such employee works."

Storms and Floods.

Reports of damage done by recent storms have been numerous for the last week. In Wisconsin the heavy rains were suddenly followed by freezing weather and numerous quantities of ice were massed in many places in the rivers. The gorge formed in the Chippewa River at Chippewa Falls was several miles long and the water of the river rose into the town, covering the tracks of the Wisconsin Central, which road had to use the tracks of the Chicago St. Paul, Minneapolis & Omaha, the transfer being made at Eau Claire. The freight station of the Wisconsin Central, was dislodged from its foundation. The stations of the Chicago, Milwaukee & St. Paul were also damaged. At Wausau, Wis., a jam in the Wisconsin River caused the water to rise and cover the tracks of the St. Paul, causing the suspension of traffic between that place and Merrill.

A second flood in the State of Washington has swept away the bridges and track which had been built since the first high water a week or so before. The Great Northern tracks between Sultan City and Everett were under water and three bridges over the Skykomish River were swept away.

The South has been visited by a snowstorm, which, together with the wind, did much damage to the telegraph lines. Augusta, Ga., had no telegraph communication for two days. In Virginia and the Carolinas the storm blocked many of the street car lines.

The heavy snows which fell lately in the Dakotas have been hard to cut through. Near Fargo, on the Northern Pacific, the drifts in the cuts were from 6 to 14 ft. deep, and were composed of frozen snow mixed with sand. The mixture was so solid that the rotary plows were able to clean in some cases only half a mile in a day. Dynamite was used to loosen the snow. Some deep cuts on the line were filled full.

Lake Ship-building.

Sixteen large and modern vessels, most of them steamers, are under way or contracted for at lake shipyards. Of this list nine are of the new 400-ft. class, averaging to cost, for the steam vessels, nearly \$250,000 each, and for the barges about \$150,000 each. One of the latter is expected to carry on 16 feet, 6,000 net tons. A tenth 400-ft. boat is nearly ready for launching. These vessels will increase the number of 400-ft. ships to about 40, against but two early in 1895. Such vessels are built to carry about 6,000 tons dead weight, which they will do as soon as sufficient water is provided in connecting channels.

Plans are prepared for a 500 ft. dry dock at Buffalo, to be built at once for the accommodation of the new type of lake ships.

At Conneaut, O., the lake terminus of the Pittsburgh, Shenango & Lake Erie, the Carnegie line, an ore and coal dock will be erected at once. The dock will be 3,200 ft. long and provided with car-dumping machines and improvements in ore unloading and handling machinery.

Lake Iron-Ore Season.

Lake marine insurance expired Dec. 1 and all ports have ceased shipping ore for this year. Official reports will not be out for a month, but the shipments have been as follows: Duluth, 1,998,000 gross tons; Two Harbors, 1,814,000 tons; Superior, 160,000 tons, all Minnesota, Escanaba and Marquette, 3,700,000 tons; Ashland, 1,566,000 tons; Gladstone, 120,000 tons; all Michigan output but a little of that from Ashland. The season has never been exceeded in gross tonnage but once, last year, when nearly a million tons more were shipped. The Minnesota Iron Co., operating mines in Minnesota, led all others with shipments of 1,411,000 tons, and was followed by the Oliver, also of Minnesota, with 808,000 tons. The Norrie, on the Gogebic range, Michigan, which has been the leading individual shipper, was surpassed this year by many mines.

Great preparations are being made for next year. The Minnesota Iron Co. is preparing to hoist ore at the rate of 150,000 tons a month all winter and will have over a million tons on the surface ready to ship by May, 1897. The Oliver Co. is preparing to ship a million tons in the year, and the Rockefeller mines, the Norrie and the Chapin can each easily do the same. As showing the enormous growth of the lake mines this fact is of interest, as well as the further fact that there are no less than 13 mines in the lake that can produce 500,000 tons each next year. Prior to 1889 no lake mine had ever shipped 500,000 tons in a year and for several years subsequently only two did so.

There have been mined on Lake Superior since 1845, when work began, the vast total of 108,000,000 gross tons of iron ore, half of it in the past seven years.

Railroads in Africa.

The French authorities in Madagascar have made a preliminary contract with a resident of the island of Mauritius (formerly a French, but now long a British possession), for the construction of a railroad from the east coast of Madagascar to the capital in the interior, Antananarivo. The company is to receive large areas of land, and have important privileges as to river navigation, etc. Lest it should make too much money, its rates are limited to 14 cents, 21 cents and 28 cents per ton per mile for the three classes of freight contemplated, and to 6.2, 9.3 and 12.4 cents per mile for the three classes of passengers, at which rate one could go first-class from New York to Boston for \$28.50, and send a ton of first-class freight there for \$64.

A French African explorer, Leon Chefneux, and a well-known Swiss engineer, Alfred Ilg, who has conducted important business matters in Abyssinia, for the government of that country, and for Europeans, have obtained a charter from Menelik, "the King of Kings," for a line in Abyssinia from the White Nile to the French possessions southeast of that country, and from the French government for a continuation of the line through the colony to the port called Jibuti. The company has a share capital of 2,000,000 francs.

626 Miles an Hour, and Sounds Plausible.

Western roads have recently set up so many claims as to their ability to make fast runs and break the record, it is possible the following story, told by an old engineer, of how he once broke all records and ran a freight at the rate of 626 miles an hour, may end the controversy for the time being. "Really, my son," said the engineer, as he oiled the wheels of the huge locomotive he had just backed into the depot, "the fastest time I ever made was the fastest run ever made in this or any other country. I was hauling freight then and running an old Baldwin mogul. We had started East with a train of 21 cars and four of them were loaded with powder. I was a little afraid of powder and was pleased to note that the cars containing it were near the rear of the train. The top of the hill was just at the entrance to the tunnel and I shut off steam and eased her up a little after getting started down the hill. That was where I made a mistake, for 10 of the cars broke loose after the engine and first 11 cars had passed the summit and they came down after us 50 miles an hour. Just about the middle of the tunnel they struck us, and then it was that I made the fast run, for you see the powder exploded and my engine and all the cars that were left shot out of the tunnel like wads out of a gun. It was 4:03 when we entered the tunnel, and allowing a minute from that time till the explosion took place we ran the eight miles in just 46 seconds, according to my watch. Old 71 lost her side rods and connecting rods, and two of her tires, and had her smokestack carried off by the wind, but she was able to pull in on the side-track, and just at that moment the operator received a telegram from O—, six miles on the other side of the tunnel, which read: 'Caboose of No. 64 and two smoking cars just flew by, leaving boards in the air, which are still falling. Rails are red-hot from the friction.'—*Chicago Inter-Ocean.*

Railroad Officers Please Copy.

Colonel Waring issued a statement yesterday announcing that he had dismissed a foreman in the Street Cleaning Department for accepting a "complimentary subscription." "This is nothing more nor less than accepting a bribe, and an enforced one at that," said the Colonel. "Men who sweep the streets all day do not want to give money to the foremen, whose duty it is to keep them sharply up to their work. They do this only when they fear that if they fail to pay up when asked to do so they will suffer for their refusal. Such collections are always 'voluntary' but it generally goes hard with him who fails to volunteer. I have reason to suppose there are other men in the department who grind such kindnesses out of their men, and I think I shall be able to get proof against some of them."—*New York Sun.*

Railroad Taxation in New Jersey.

The New Jersey State Board of Assessors has made its annual assessment for 1896. The number of miles of railroad track in the state is 4,558. The total assessment of railroad property is \$221,757,969, an increase of about one million dollars over the preceding year; the total amount of taxes assessed is \$1,521,495, an increase of \$7,085. About two-thirds of the money collected on account of these taxes goes to the state and the rest to the towns and counties.

The taxes on corporations pay the whole of the expenses of the New Jersey state government. New Jersey collects a large sum in taxes from miscellaneous corporations, which do most or all of their business in other states. There are 4,508 of these corporations, and the taxes assessed against them amount to \$1,060,823.

LOCOMOTIVE BUILDING.

The Rogers Locomotive Works have received an order for 18 engines for Japan.

The Pennsylvania has given an order to its Juniata shops for three new locomotives.

The Brooks Locomotive Works have an order from the Mexican Central for five 10-wheel passenger engines with 20 x 24 in. cylinders.

CAR BUILDING.

The Wilmington & Northern is in the market for over 200 gondola cars.

The Indianapolis Car Works are building 50 stock cars for the Mather Stock Car Co.

The contract for the 100 stock cars for the Chicago, Hammond & Western, mentioned in this column a week or so ago, was awarded to the Haskell & Barker Car Co.

The Missouri Car & Foundry Co., of St. Louis, has been awarded the contract for building the 1,000 cars for Baltimore & Ohio service which were referred to in this column last week. These cars are to be owned by the Fairport Warehouse & Elevator Co., as then stated.

BRIDGE BUILDING.

Albany, Ga.—It is stated that bids are asked Jan. 11 for a double-track iron and steel bridge over Flint River. W. O. Watson.

Annandale, N. J.—The Central Railroad of New Jersey proposes depressing the public highway which now crosses its main line a short distance west of here. A steel bridge, 30 ft. long, is to be built, with clearance underneath of 13 ft. The work will cost \$7,000.

Astoria, Or.—It is stated that the county contemplates building a draw bridge, to cost \$6,000 to \$10,000, across Young's River, near this city. The bridge will probably be built next spring.

Braddock, Pa.—It is stated that bids are now being asked for the superstructure of the new bridge which is to be built over the Monongahela at West Braddock by the Braddock & Homestead Railway Co. It consists of three spans of 518-ft., 490 ft. and 255 ft. long, respectively, together with about 1,100 ft. of viaduct. Wilkins & Davison, Pittsburgh, are the engineers.

The plans for the new Thirteenth street bridge at this place have been finished. The bridge will be built next summer, and over it the Homestead and Highland lines will again cross the Monongahela to Duquesne.

Buffalo, N. Y.—The Board of Public Works has been directed to prepare plans and specifications and to ask for bids for an iron bridge and abutments over Cazenovia Creek, at Cazenovia street. M. S. Hubbell is City Clerk.

Burlington, Vt.—Iron railroad bridges are to be put in at once over the New Haven River at Brooksville and over the Otter Creek, 4 miles south of Middlebury. A trestle is going in at Brooksville, and its erection will be pushed. A pile driver is at work in Otter Creek driving piles for the temporary structure over which trains will pass during the building of the iron bridge.

Dayton, O.—F. M. Turner has submitted an estimate of \$158,000 to the Board of City Affairs for the new steel bridge to replace the Third street structure over the Miami River, and also an estimate of \$138,000 for one over the same river at Main street.

Marietta, O.—The Marietta & Williamstown Bridge Co. has been chartered, with a capital stock of \$400,000, of which \$100,000 has been paid in. The incorporators are William C. Jutte, August Jutte, C. M. Buchanan, C. Creamer and Lewis C. Burton. The company has plans partially completed for a railroad and highway bridge over the Ohio River between this city and Williamstown, W. Va. The completion of the plans and preliminary work are being pushed, and the bridge proper will be commenced as soon as the stage of water in the river will permit.

New York.—The Board of Estimate last week gave a public hearing to a number of interested property owners and business men who wished to protest against the new Third Avenue bridge now being built across the Harlem River. Mayor Strong promised to see if some remedy could not be applied. It is probable that the plans for the approaches will be amended to include an approach on Third Avenue if the legislature authorizes the necessary additional appropriation.

At a meeting of the Park Board it was voted to award the contract for the repairs on the Madison Avenue bridge to Augustus Smith, whose bid was \$6,470.

Norfolk, Va.—Contracts have been let for the bridge to be built over Smith's Creek, on Granby street, extended as follows: Piling, to Justin McCarthy, of Norfolk, at \$16,500; superstructure, to the Youngstown (O.) Bridge Co., at \$5,419. About \$1,000 will be spent for abutments.

Pittsburgh, Pa.—It is stated that the Pennsylvania agrees to build a retaining wall and bridge at Thirtieth street if the city vacates Jane street from Thirtieth to Thirty-fifth streets, more yard room for the Monongahela Division being needed.

Common Council has favorably considered the proposition of the Consolidated Traction Co. to have the city build new bridges over the Pennsylvania at Penn. Shady and Highland avenues. The ordinance had been amended in committee so that, in case the bridges cost more than \$34,000 or less, the company is to pay the ratio of \$20,000 to \$34,000; also that gas and water-pipes be placed under the roadbed, if possible, and the road bed changed from Ligonier block to Trinidad asphalt.

St. Paul, Minn.—L. W. Rundlett, City Engineer, has prepared plans for a steel bridge over the Chicago, Milwaukee & St. Paul at Summit avenue. It will be 60 ft. long, 100 ft. wide and is estimated to cost \$28,500. It will be built by the railroad.

Shepherdstown, W. Va.—The Maryland & Virginia Bridge Company has increased its capital stock from \$5,000 to \$10,000, and will repair and repaint its bridge over the Potomac, at this place.

Titusville, Pa.—It has been decided by the County Commissioners to build a bridge 180 ft. long over Oil Creek, on West Central avenue. It will have two abutments and its northern approach will be 11 ft. above the creek embankment and at the south end 9 ft. above. Contracts will soon be let.

The City Council has passed a resolution agreeing to build the approaches to the new iron bridge across Oil Creek at Brown street.

Waterloo, N. Y.—The Gorton Bridge Manufacturing Co. has received the contract for rebuilding the Gorham Bridge at this place. Their bid was \$2,199; that of the Havana Bridge Works, \$2,280, and the Canton Bridge Co., \$2,247.

Williamsport, Pa.—In its report to the Court the Grand Jury recommends the building of new bridges across Loyalsock Creek, in Montoursville, and across Mill Creek, in Hepburn Township, at a cost not to exceed \$28,000 and \$2,000, respectively.

RAILROAD LAW—NOTES OF DECISIONS.

Carriers of Goods and Injuries to Property.

In Iowa, after horses had entered upon a railroad company's inclosed right of way without fault of the company, a brakeman was sent ahead to assist the keeper in removing them. The train was slowly moved forward with all possible caution, and came to a stop a quarter of a mile from the horses, which broke past the keeper and brakeman, and ran into a bridge. The Supreme Court rules that the moving of the train was not negligence.¹

In Iowa the mere fact that a horse ran or jumped over a cattle guard is held insufficient to establish that the guard was defective.²

In Texas where a carrier had negligently loaded a log on a flat car, so that the end of it protruded over the end of the car in such a manner as to come in contact with a car in which horses were being shipped, the carrier was held responsible for damages resulting to the horses, though the injury did not occur till the cars had passed onto a connecting line.³

In Kentucky a railroad is not liable for failure to furnish cars to a coal company for shipment of coal, the railroad having, by reason of a strike among the em-

ployees of all the other coal companies in that district, been obliged to take its coal cars on to another division of its road, to haul coal to supply its engines.³

In North Carolina it is laid down that the failure of a railroad in the construction of its road, under lawful authority, to leave between embankments sufficient space for the passage of the waters of a stream in case of any rise that might reasonably be expected, creates neither a public nor a continuing private nuisance, and therefore the damages resulting to landowners therefrom may be compensated by the assessment of present and prospective damages in a single action.⁴

In the Federal Court, while certain of plaintiff's goods were lying in defendant's freight depot—their transportation having ended, and the railroad being responsible for them as a warehouseman—a drayman brought a carboy of sulphuric acid to the depot, for shipment, and unloaded it there. All the defendant's employees who were about the depot were engaged in other parts of it, and, though it was defendant's rule that carboys of acid should not be placed inside the depot, there was no one present to enforce the rule, or see what the drayman did with the carboy. He placed it inside the depot, near a spot where the floor was saturated with oil; and, in consequence of a leak in the carboy, an explosion occurred, which set fire to the depot, and plaintiff's goods were destroyed. The Supreme Court rules that defendant was negligent in failing to exercise a reasonably supervision over the storage of articles in its depot, and in the care of the building where its patrons' property was stored, and, accordingly, was liable to plaintiff for the value of his goods destroyed.⁵

In Nebraska it is laid down that it is the duty of an engineer in charge of a train to exercise such a lookout as is consistent with his other duties to ascertain the presence of obstructions on the track, and if such a precaution would have revealed the presence of trespassing stock in time to have avoided their injury by the use of ordinary care, the railroad company is liable for injuries inflicted upon them, although they were not actually seen until too late to avoid striking them.⁶

In West Virginia it is held that the mere fact that the company used salt on switches in freezing weather as the only effective mode of freeing them from ice did not render it liable for the killing by its trains of stock which were lured to the track by the salt.⁷

Injuries to Passengers, Employees and Strangers.

In a Pennsylvania case defendant railroad, a Pennsylvania corporation, issued and delivered to plaintiff, in the state of New Jersey, a pass from Philadelphia to Elmira, N. Y., which provided that plaintiff assumed all risks of accident. Plaintiff was injured within the state of Pennsylvania, by the admitted negligence of defendant's employees. The Supreme Court rules that the contract of carriage, since it was to be performed in Pennsylvania, was governed by the laws of that state, and not by the laws of the place where it was made.⁸

In Connecticut, in an action for injuries received while a passenger on defendant's train, there was evidence that defendant ran its trains over the track of another company at the place where plaintiff was injured; that defendant was bound by its agreement with such other company to obey the orders and signals given by the servants of that company; and that the injury was caused by the negligence of servants of the latter company in the management of one of its trains. The Supreme Court rules that it was not error to charge that the servants of such other company, while operating its trains on that part of the track used in common by both companies, might, for the purposes of the case, be regarded as the servants of defendant.⁹

In Texas it is held that where a passenger, because the car in which he was riding was not sufficiently heated, attempted to pass from it to another car while the train was in motion, in order to find a warmer one, and was injured, the failure of the carrier to heat the car was not the proximate cause of the injury.¹⁰

In Texas the Court of Civil Appeals holds that a railroad ticket containing a stipulation that it is "good for a continuous passage on and from the date stamped on the back" is limited to use upon the day it was dated, and such further time as is necessary to complete the continuous passage.¹¹

In Indiana, while plaintiff, with another employee was standing on the station platform, helping to unload a large box from a freight car, the conductor, who was within the car, pushing on the box, stepped into a hole, which had been burned through the floor of the car, thereby losing his hold on the box, and plaintiff, being unable to bear the weight so suddenly cast upon him, fell and was injured by the falling box. The Supreme Court rules that the hole in the car floor was not the proximate cause of the injury.¹²

In Texas it is held that a stipulation in a contract of employment between a railroad and a brakeman, requiring the brakeman not to attempt to couple cars unless he knows the coupling is in proper condition, is not binding, so as to require the brakeman to perform the master's duty of seeing that its appliances are in proper condition.¹³

In Pennsylvania, in an action against a railroad for the death of plaintiff's husband, an employee of a quarry company, it appeared that while a train crew of the defendant was absent from the quarry yard, after having placed cars on the private track of the quarry company, a derrick was loosened by a blast; that the train crew had no knowledge of such fact; that when the train crew came to take the cars out they were not notified that the derrick ropes had been loosened, and, in moving the cars one of the ropes caught in the wheels of the rear car, causing the derrick to fall upon deceased; that the train was under the general direction of the quarrymen. The Supreme Court rules that the evidence was insufficient to show negligence on the part of the railroad company.¹⁴

In a case in the Federal Court C., a fireman on a locomotive, while in the discharge of a duty assigned him by the engineer, and in a position which he could naturally and properly assume for the purpose of such duty, was knocked from the engine by a station-limited board placed near the track. The court rules that it followed from these circumstances that the board was too near the track, and was a dangerous structure, the maintenance of which was negligence in the receivers.¹⁵

In New York it is decided that a new wick in the headlight of a locomotive, to replace an old one, is a supply, and not a repair; and where a rule of the railroad company requires the engineer to see that the headlight is in order, and he fails to do so, in consequence of which a fireman on another train is injured, the injury is the result of the negligence of a fellow-servant.¹⁶

In Indiana an owner is not guilty of contributory negligence when he has securely inclosed his stock, and they escape without his knowledge or fault, and, at a highway crossing, are killed by a passing train.¹⁷

In the same state in an action for the death of a deaf man, run over by defendant's train while walking on its track, located on a street, the evidence showed that the

train was running at an unlawful speed, that the engineer saw deceased on the track, with his back to the train, and kept his eyes constantly on him, while going over 2,700 ft., and saw that, although the bell was rung and the whistle sounded, deceased gave no heed; that two men, within the plain range of the engineer's vision, were making signals to attract deceased's attention; and that the engineer made no effort to check the speed of the train until he was within 40 ft. of deceased. The Supreme Court holds that the facts authorized the jury to find that the killing was willful, though the engineer denied that he intended to kill the man or run over him.¹⁸

In North Carolina plaintiff was injured while crossing a railroad trestle which the public was warned not to walk on. He saw the train coming and got out on the cap sill. The engineer had applied the brakes when he first saw plaintiff, but seeing him going out on the cap sill, and knowing that workmen often got on the cap sill to avoid trains, released the brakes, believing the plaintiff perfectly safe, though having the train under control, he could have stopped had he believed it necessary. The Supreme Court rules that the jury should have been instructed that if the engineer, on the reasonable belief that plaintiff was safe, released the brakes, when, but for such belief, he would have stopped the train, the plaintiff could not recover.¹⁹

In Texas the question whether a person about to cross a railroad track at a public crossing is negligent in failing to look and listen for an approaching train is for the jury.²⁰

In Texas it appeared that plaintiff got on a flat car of defendant's freight train, and was a trespasser; that he was a man of weak mind; that defendant's brakeman ordered him to get off the train while it was moving rapidly; that defendant said he would if the train was stopped; that the brakeman told him that if he did not get off he would get his gun and kill him, and started toward the caboose; and that plaintiff, believing he would execute his threat, jumped off the train and was injured. The Supreme Court rules that the court properly refused an instruction which made defendant's liability depend on a gun being in the caboose, and the ability of the brakeman to put his threat into execution at the very time plaintiff jumped from the train.²¹

In North Carolina in an action for the death of plaintiff's intestate, it appeared that, while lying helplessly upon defendant's railroad track, at night, he was struck by a train drawn by an engine running tender foremost; that the only light used on the tender was a small hand lantern, held by a man placed there for that purpose, and that the train was running 25 miles an hour. The Supreme Court rules that it was for the jury to determine whether, with a headlight, and by the exercise of due diligence, defendant's engineer could have discovered that plaintiff was lying helpless on the track in time to have stopped the train before it came in contact with him.²²

In Nebraska the driver of a private conveyance is the agent of the passenger so as to charge the latter with the former's negligence in going upon a railroad crossing without first looking and listening for the approach of a train.²³

In Texas where employees of a railroad suddenly ran an engine against cars standing near a crossing which they knew was used by children going to and from school, so as to drive them upon the crossing and cause them to run over a child who was with due care attempting to cross, the company was held liable.²⁴

¹ Barnhart vs. C., M. & St. P., 66 N. W. Rep., 902.

² G. H. & S. A. vs. Herring, 36 S. W. Rep., 129.

³ L. & N. v. Queen City Coal Co., 35 S. W. Rep., 626.

⁴ Ridley v. S. & R., 24 S. E. Rep., 730.

⁵ F. L. & T. v. O. R. & N., 73 Fed. Rep., 1003.

⁶ O. & R. v. Wright, 66 N. W. Rep., 842.

⁷ Kirk v. N. & W., 24 S. E. Rep., 639.

⁸ Burnett v. P. R., 34 Atl. Rep., 972.

⁹ Murray v. Lehigh Val., 34 Atl. Rep., 506.

¹⁰ Sickles v. M., K. & T., 35 S. W. Rep., 493.

¹¹ T. & N. O. v. Powell, 35 S. W. Rep., 841.

¹² L. N. A. & C. v. Southwick, 44 N. E. Rep., 263.

¹³ M., K. & T. v. Wood, 35 S. W. Rep., 579.

¹⁴ Forrest v. P. W. & R., 34 Atl. Rep., 601.

¹⁵ Central Trust Co. v. E. T., V. & G., 73 Fed. Rep., 661.

¹⁶ Simpson v. C. V., 30 N. Y. S., 464.

¹⁷ P., C. & St. L. v. Shaw, 43 N. E. Rep., 957.

¹⁸ L. E. & W. v. Bradford, 43 N. E. Rep., 882.

¹⁹ Little v. C. C., 24 S. E. Rep., 514.

²⁰ Int. & G. N. v. Eason, 35 S. W. Rep., 208.

²¹ H. & T. C. v. Grigsby, 35 S. W. Rep., 815.

²² Lloyd v. A. & R., 24 S. E. Rep., 805.

²³ O. & R. v. Talbot, 67 N. W. Rep., 509.

²⁴ G. C. & S. F. v. West, 36 S. W. Rep., 101.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, quarterly, 2 per cent., payable Dec. 31.

Boston & Lowell, 3½ per cent., payable Jan. 1.

Chicago & Eastern Illinois, quarterly, 1½ per cent. on preferred stock, payable Jan. 2.

Chicago & Northwestern, 2½ per cent. on the common stock and regular quarterly dividend of 1¼ per cent. on preferred stock, both payable Jan. 2.

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1½ per cent. on preferred stock, payable Jan. 2.

Columbus, Hocking Valley & Toledo, 2½ per cent., payable Jan. 2.

Denver & Rio Grande, 1 per cent. on preferred stock, payable Jan. 15.

Eastern (N. H.), 1½ per cent. payable Dec. 15.

Little Miami, quarterly, 2 per cent. on the guaranteed stock, payable Dec. 10.

Lowell & Andover, 4 per cent., payable Dec. 6.

Maine Central, quarterly, 1½ per cent., payable Jan. 1.

Nashville & Decatur, semi-annual, 3 per cent., payable Dec. 1.

New York & Harlem, 4 per cent., payable Jan. 2.

Portland & Rumford Falls, quarterly, 1¼ per cent., payable Dec. 1.

Southern, 1 per cent. on preferred stock, payable Jan. 4.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Rome, Watertown & Ogdensburg, annual, Central Trust Co., New York, Dec. 28.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Association of General Baggage Agents* will hold a convention at Richmond, Va., on Jan. 20, 1897.

The *International Association of Car Accountants* will hold a convention at New Orleans, La., on Feb. 23, 1897.

The *American Railway Association* will hold its convention at Richmond, Va., on April 7, 1897.

The *National Convention of Railroad Commissioners* will be held at St. Louis, Mo., on May 11, 1897.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Westeyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds, in formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building Roanoke, at 8 p. m.

Canadian Society of Civil Engineers.

The annual meeting will be held in the society's rooms, 112 Mansfield street, Montreal, on Tuesday, Jan. 12 next, at 10 a. m. The Grand Trunk, Canadian Pacific and Intercolonial railways have made a special rate of one fare to the meeting.

Civil Engineers' Club of Cleveland.

A regular meeting of the Civil Engineers' Club of Cleveland was held in the rooms of the club, Case Library building, Cleveland, O., on Dec. 8, 1896. Mr. Jos. W. Willard read a paper upon "Explosives—a brief history; their adaptation to the arts and engineering; possible future use in warfare of so-called high explosives."

New York Railroad Club.

The following were the officers elected at the last meeting of the club: President, A. E. Mitchell (Eric R. R.); Vice-Presidents, H. H. Vreeland (Metropolitan Traction Co.); C. M. Mendenhall (Pennsylvania); D. B. McCoy (N. Y. Central & Hudson River); Treasurer, C. A. Smith; Executive Committee, W. W. Snow, W. E. Ennis and S. Higgins; Finance Committee, R. M. Dixon, D. M. Brady and C. S. Henry.

St. Louis Railway Club.

The subjects for discussion at the meeting to-day, Dec. 11, are: Increasing Locomotive Mileage by Lengthening of Runs, based upon the paper presented at November meeting by C. W. Fekerson, M. M., St. Louis Division C. B. & Q. R. Co.; Beardstown, Ill; The Mechanical Properties of Wrought Iron and Steel, as Shown by

Actual Tests, based upon the paper presented at November meeting by J. B. Johnson, Professor of Civil Engineering, and Director of the Testing Laboratory of Washington University, St. Louis.

A paper will also be presented by Jos. R. Cavanagh, Superintendent of Car Service, C. & St. L. Ry., Indianapolis, entitled The Pooling of Freight-Car Equipment.

Engineers' Club of St. Louis.

The annual meeting of the Engineers' Club of St. Louis was held Dec. 2, at 1600 Lucas Place, 30 members and 12 visitors being present. S. Bent Russell read the report of the Nominating Committee as follows: For President, Edw. Flad; for Vice-President, William H. Bryan; for Secretary, Richard McCulloch; for Treasurer, Thomas B. McMath; for Librarian, Julius Baier; for Directors, J. A. Ockerson and B. H. Colby; for Board of Managers, J. B. Johnson and E. A. Hermann. Other nominations being called for, Mr. Carl Gaylor was nominated for Vice-President.

Prof. J. B. Johnson showed the club a large number of lantern slides which had been prepared originally to accompany his paper recently read before the St. Louis Railway Club on "The Mechanical Properties of Wrought Iron and Steel as Shown by Actual Tests," the views being shown this club by special request.

The Chicago Electrical Association.

The Chicago Electrical Association held its regular meeting on Friday evening, December 4, at 1737 Monadnock Block, Chicago.

Mr. G. W. Knox, Electrical Engineer of the Chicago City Railway, presented a paper, "Notes on the Modern Ground Return System," and claimed that copper bonds at rail joints were defective, and pointed out that the hole in the rail should be amalgamated before the insertion of the copper bond. At present he is making experiments with cast-lead road joints where the rails are polished before casting the joint.

Among those who took part in the discussion were Mr. W. R. Garton, Central Electric Company; Mr. Thomas G. Grier, Western Electric Company, and Mr. W. A. Harding, Master Mechanic Calumet Street Railroad.

At the next meeting, Dec. 18, Mr. E. S. Jenness, of the Western Electric Company, will read a paper, "Decorative Lighting." At this meeting the election of officers will take place.

Road Masters' Association of America.

In the list below are given the names of the chairmen of the committees appointed to report at the next annual convention of the association, and the subjects for report and discussion:

Best Method of Preventing Creeping of Rails, Chairman, F. J. Allen, C. B. & Q. R. R., Aurora, Ill.; Tie Plates, the Benefits and Results Obtained from Their Use, Chairman, E. E. Stone, B. & A. R. R., Springfield, Mass.; Track Joints, Results Obtained from Use of Various Devices, Chairman, C. E. Jones, C. B. & Q. R. R., Beardstown, Ill.; Is it Most Economical to Put in Ties Out of Face or in Patches? Chairman, F. R. Coates, N. Y., N. H. & H. R. R., Stamford, Conn.; Latest Improvements in Frogs and Switches, Chairman, W. J. Prindle, Pennsylvania Co., Chicago, Ill.; Paper, Best Method of Directing and Supervising the Work of Section Foremen, What Reports are Necessary for the Special Information of the Roadmaster to Enable Him to Successfully Direct and Control the Work, H. W. Church, L. S. & M. S. R. R., Englewood, Ill.

Society of Railroad Club Secretaries.

The secretaries of the railroad clubs of the country have followed up their meeting at Saratoga last year during the conventions, with a meeting in New York City last week at which it was decided to form a permanent organization. The secretaries of the New York, Central, New England, Western, Southern & Southwestern, Northwestern and St. Louis Railroad clubs were represented. Mr. W. W. Wheatley was elected chairman. It was decided to recommend that the present circulation of the proceedings of the different railroad clubs among the members of all clubs be suspended and that a rule be adopted that a member may be furnished with the proceedings of other clubs than that of which he is a member on payment of one dollar a year. This action is deemed to be necessary on account of the increasing membership of the clubs and the corresponding increase of expenses. The visitors were entertained at dinner and the theater in New York City by members of the New York Railroad Club, and they also went over the lines of the Metropolitan Traction Co., in New York City, and of the Brooklyn Heights Railroad Co., in Brooklyn.

Western Society of Engineers.

A regular meeting of the Western Society of Engineers was held in the society rooms, Monadnock Block, Chicago, Wednesday evening, Dec. 2. The attendance was unusually large, due to the interest taken in the subject of the evening, which was presented in a paper, "Electric Traction," by Mr. Edward Barrington, of Washington, D. C., the paper being read by the Secretary.

Mr. J. F. Wallace, Chief Engineer, of the Illinois Central, opened the discussion, and among other things said that with the Illinois Central, electric traction was merely a question of ultimate cost, and as soon as the officers were convinced that it was more economical than the present system, the Illinois Central would make the change, that up to this time it had been impossible to get data which would form a basis for comparison, and electrical engineers were urged, if possible, to present figures in the discussion of this paper which would be of value to officers of steam roads contemplating a change of motive power.

Mr. H. A. Parkhurst, of the same road, supplemented the remarks of Mr. Wallace with figures showing the cost of handling passengers on the Illinois Central during the World's Fair, using steam equipment.

Mr. L. L. Summers, Electrical Engineer, spoke in favor of electric motor power, while Mr. H. M. Brukerhoff, Electrician for the Metropolitan West Side Elevated, gave the experience of that road using electricity, calling attention to the very satisfactory working and few delays to trains, but did not give figures showing the cost of operation.

Mr. M. Coster, of the Westinghouse Electric & Manufacturing Company, and Prof. D. C. Jackson, of the University of Wisconsin, agreed with the remarks of Mr. Wallace, and considered that a road with a large steam equipment could not afford to change at this time.

The discussion was continued Dec. 9. At this latter meeting Prof. D. C. Jackson presented a paper, "The Equipment of Manufacturing Establishments with Electric Motors and Electric Power Distribution," which was held over on account of the length of the discussion at the last meeting.

PERSONAL.

—Mr. D. Bosman has been elected Secretary of the Chicago & Erie, with office at New York.

—Mr. A. W. Anderson, Superintendent of the Charleston & Western Carolina, has been promoted to the position of General Superintendent.

—Mr. Robert S. Hair, Traveling Passenger Agent of the Great Northern & Northern Steamship Co., with headquarters in Buffalo, has resigned.

—Mr. Robert T. Baker has been appointed General Superintendent of the Morristown & Cumberland Gap vice H. M. Aiken, previously General Manager.

—The Board of Railroad Commissioners of the State of Vermont now has two new members, and the complete Board is as follows: Olin Merrill, Z. S. Stanton and Frank Kentfield.

—Mr. J. J. Fletcher, Freight Traffic Manager of the Kansas City, Fort Scott & Memphis, has been made General Traffic Manager of the road, in charge of freight, passenger and express traffic.

—Mr. Thomas P. Carpenter, Commissioner of the Buffalo Coal Association retired on Dec. 1 and the office has been abolished. Hereafter the association will merely collect statistics relating to the local coal trade.

—Mr. W. W. Coe, recently and for many years Chief Engineer of the Norfolk & Western, will remain in the service of the company on special work, although the office of Chief Engineer has been abolished, as stated last week.

—Mr. W. C. Shoemaker, who has been Chief Clerk to Superintendent S. B. Floeter, of the Cincinnati, Hamilton & Dayton, at Lima, O., has been appointed Assistant Superintendent of the Dayton & Michigan division of that road.

—Mr. John Adair, Joint Agent for the Baltimore & Ohio Southwestern and Baltimore & Ohio, at Parkersburg, W. Va., has resigned, after 51 years of continuous service with the former company, 20 years of which has been passed at Parkersburg.

—Mr. Frank Barr, Superintendent of Worcester, Nashua and Portland Division of the Boston & Maine road, has been appointed Assistant General Manager, in place of Mr. George F. Evans, of the Boston & Maine, who becomes General Manager of the Maine Central.

—Mr. Andrew J. McCabe has recently been appointed Superintendent of the Butte, Anaconda & Pacific road. Mr. McCabe was for many years with the North-Western Pacific and became Division Superintendent at Jamestown, N. Dak. Afterward he went to the Great Northern as Superintendent on one of the main-line divisions and later was transferred to the Eastern Minnesota Division.

—The new secretaries of the Nebraska State Board of Transportation, under the Populist government, are G. L. Laws, of Lincoln, a free-silver Republican and formerly a member of Congress; J. W. Edgerton, Populist, and J. C. Dahlman, Democrat. The secretaries are the active officers of the board, the other five members being the Secretary of State, the Attorney-General and other department officials.

—Mr. F. G. Pratt, who has been with the General Electric Co. since 1892 in charge of its catalogue department, died on Nov. 7 last in his 36th year. Mr. Pratt was a graduate of Harvard, and after teaching several years went into railroad work on the Boston & Albany, and then became engaged upon the surveys of a Southern road. He was in the service of the Union Switch and Signal Co. until its connection with the General Electric Co.

—Mr. W. B. Shattuck, an old railroad officer, and very well known in the railroad world, was elected a member of Congress from Ohio at the recent election. He held the office of General Passenger Agent on the old Atlantic & Great Western between 1867 and 1882, and a similar office with the Ohio & Mississippi for the next 10 years, until 1893. In that year he became Commissioner of the Passenger Department under the agreement between the Louisville, Cincinnati & St. Louis lines.

—Maj. William W. Vass, of Raleigh, N. C., for more than 50 years the Treasurer of the Raleigh & Gaston road, now a division of the Seaboard Air Line, and for many years Treasurer of the Raleigh & Augusta Air Line, and in recent years Secretary of the Raleigh & Gaston, died in Raleigh, Dec. 7, aged nearly 77 years. He resigned as Treasurer only two years ago on account of failing health and because his continuation in the position would require the removal of his residence from Raleigh to Portsmouth, Va.

—The vacancy on the Massachusetts Railroad Commission, caused by the death of Mr. Dale, has been filled by the appointment of Mr. Hersey B. Goodwin, of Cambridge, prominently connected with Boston mercantile interests. Mr. Goodwin is 60 years old and has for 40 years been in foreign trade, beginning in the India business and later becoming an exporter of breadstuffs, in which business he is still engaged. He has been President of the Boston Corn Exchange, the Associated Board of Trade and other public bodies, and is a trustee of the Cambridge Public Library.

—General Traffic Manager George F. Randolph, of the Baltimore & Ohio Southwestern, was injured in a collision on that road near Storrs, O., last Monday morning, and General Passenger Agent J. M. Chesbrough was less severely hurt. Mr. Randolph sustained a dislocation of the shoulder and Mr. Chesbrough a slight concussion of the brain. The accident was a severe butting collision between a special officers' train and a regular passenger train, and engineer Price and fireman Dixon were instantly killed. Seven passengers and trainmen were injured in various ways, but, according to the press reports, not dangerously. It is said that the conductor and the engineman of the special both forgot about the regular train. There was a dense fog at the time.

—Mr. John L. Thurber, of the Sherwin-Williams Co., of Cleveland, O., died suddenly at the Hollenden Hotel, Cleveland, Dec. 3. Mr. Thurber first became connected with the railroad trade in 1878 with Charles Ham, of Rochester, N. Y. Later he was connected with Williams, Page & Co. of Boston, and the Adams & Westlake Co. of Chicago. In 1888 he accepted the position in the railroad department of the Sherwin-Williams Co., which he held at his death.

Mr. Thurber was a representative of the best type of salesman. He had the esteem and confidence of his employers to an unusual degree, and his relations with them were peculiarly pleasant and intimate. A man of the highest character, he quickly won the regard of those with whom he dealt, and he had secured a very wide acquaintance in all sections of the country. Mr.

Thurber was only 48 years of age, and his death is untimely. He leaves a widow and four children, who reside in New York City.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—A number of changes were made in the auditing department on Dec. 1. The office of Auditor in Topeka has been abolished and the several departments now report to General Auditor H. C. Whitehead, in Chicago.

H. A. Dunn, who has been in charge of the office as chief clerk since the death of J. F. H. McKibben, has been appointed Assistant Auditor of Disbursements.

Baltimore & Ohio.—Appointments were announced on Oct. 1 as follows: W. D. Vincent, to be Chief Dispatcher of the second and third divisions, with headquarters at Cumberland; C. L. Brevort, to be General Yardmaster at Cumberland; J. D. Wright, to be General Foreman of Painters at the Mt. Clare shops.

Boston & Maine.—Superintendent Frank Barr, of the Worcester, Nashua & Portland Division, has been appointed Assistant General Manager, in place of George F. Evans, who becomes General Manager of the Maine Central. Mr. Barr's appointment dates from Dec. 1. G. S. Lee, Train Dispatcher, has been appointed Superintendent of the Worcester & Rochester Division, in place of Mr. Barr.

Cleveland, Cincinnati, Chicago & St. Louis.—The following changes have been announced: H. F. Houghton, Assistant Superintendent, with office at Indianapolis; Thomas Reynolds, Train Master, with office in Cincinnati, in charge east of Indianapolis; O. W. Beckwith, Train Master, with offices at Kankakee, Ill., in charge west of Indianapolis.

Duluth, Missabe & Northern.—George M. Naylor has been appointed General Auditor of this company, at No. 1 Broadway, New York City.

Fitchburg.—C. L. Mayne, formerly Division Superintendent, has been appointed Assistant General Superintendent, with headquarters at Fitchburg.

Florida Southern.—At the annual meeting, held in Jacksonville, Fla., on Dec. 1, the following Board of Directors were re-elected: H. B. Plant, M. F. Plant, R. G. Erwin, D. F. Jack, G. H. Tilly, R. B. Smith, F. Q. Brown, W. W. Blacker and Jacob Edwards. Officers were elected as follows: F. Q. Brown, President; M. F. Plant, Vice-President; R. B. Smith, Secretary, and J. M. Lee, Treasurer.

Kansas City & Omaha.—The executive officers of this company are now as follows: E. C. Benedict, President; F. K. Pendleton, Vice-President and General Counsel; S. L. Parrish, Secretary; P. Chauncey Anderson, Treasurer; all with offices at New York; J. G. Drew, Assistant Treasurer, with office at St. Joseph, Mo.; E. Ellery Anderson and F. K. Pendleton, Executive Committee, New York.

Maine Central.—The official announcement of the election of Mr. George F. Evans as General Manager, as successor to Mr. Payson Tucker, states that he "will have charge of the business and affairs of the company, and of the maintenance and operation of its railroads and property, under the direction of the President and the Board of Directors, or Executive Committee."

Maricopa, Phoenix & Salt River Valley.—C. C. McNeil has been appointed General Superintendent, vice E. Shamp, resigned on account of illness. H. S. Creighton has been appointed Acting Auditor, vice C. H. Gordon, previously Auditor.

Mexican National.—G. N. Collum having resigned the position of Assistant General Freight Agent, the duties of that position will until further notice be performed by the General Freight and Passenger Agent, B. W. Thacher.

Mexican Northern.—Geo. Foster Peabody has been elected First Vice-President and E. M. Shepard Second Vice-President, both with office at New York.

Milwaukee & Superior.—The present officers of this company are as follows: Winfield Smith, President; Samuel Rosendale, Secretary; Henry Herman, Treasurer; A. H. Hadfield, General Manager; Geo. W. Wilson, Auditor. General offices, Milwaukee, Wis.

Missouri, Kansas & Texas.—Vice-President and Treasurer Hedge having resigned the office of Secretary the Executive Committee has elected S. Halline Secretary of the company.

Pittsburgh & Eastern.—The officers of this road, just opened for operation, are as follows: C. C. Watt, President, Bullitt Building, Philadelphia, Pa.; S. H. Hicks, Vice-President and General Manager, Philadelphia and Mahaffey, Pa.; L. V. Biggs, Secretary and Treasurer, Philadelphia.

Southern.—B. T. Reynolds has been appointed Car Accountant, with office at 1300 Pennsylvania avenue, Washington, D. C.

Terre Haute & Indianapolis.—Receiver Malott, of the Vandalia, has appointed John G. Williams, General Counsel, with office at Indianapolis, Ind. He will have charge of the law business of the receiver and tax matters, and the settlement of claims for damages to property and personal injuries will be made under his supervision and by his direction. Mr. T. J. Golden has been appointed Assistant Counsel, with office at Terre Haute, Ind. Mr. Golden was formerly General Attorney, with office at St. Louis.

Wheeling & Lake Erie.—Downer Adams has been appointed Local Treasurer of this company. J. H. Dowland has been appointed Auditor, vice Downer Adams, transferred. By order of the Board of Directors.

Wheeling Bridge & Terminal.—C. H. Coit has been elected Vice-President, with office at Hartford, Conn. H. W. Hayden has been elected Secretary and Treasurer, with office at New York.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Addison & Pickens.—It is given out that work on this road, an extension of the West Virginia & Pittsburgh, from Pickens to Addison, W. Va., 12 miles, will be commenced within two weeks. The County of Webster subscribed \$15,000 to the road, provided operations were under way by Jan. 30.

Ashley, Kendallville & Peru.—The survey for this road, which is proposed by Detroit capitalists, has been partly completed, and application has been made for a charter. The line is proposed from Ashley, Ind., near the Michigan state line, to Chili, Ind.

Atchison, Topeka & Santa Fe.—It is reported that a branch of this road will be built from Perry, Okla., southeast 30 miles, to Stillwater, also into the coal fields near South McAlester.

Bayfield, Washburn & Iron River.—Proceedings have been begun at Ashland, Wis., to defeat the issue of \$240,000 worth of railroad bonds, pledged to build 48 miles of road from Bayfield, Wis., to Iron River. The bonds were delivered to the Milwaukee Trust Co. in escrow in January, 1896. The complaint alleges that the bonds increase the indebtedness beyond the constitutional indebtedness, that no survey has been made and that the road is not a bona fide one. The case will be carried through the Supreme Court.

Beech Creek.—Eighteen miles of the extension into Cambria County, Pa., will be completed by Jan. 1, 1897.

Bridgton & Saco River.—An extension will probably be constructed from Bridgton to Harrison, Me., a distance of five miles, next spring. The preliminary survey of the road will be made next week by the Civil Engineers, Hilsley and Cummings. The line is of 2-ft. gage.

Boise, Nampa & Owyhee.—This company has arranged with the Union Pacific for the purchase of enough rails for 27 miles of the road. This will carry the track beyond Snake River. About one mile of track has been laid out of Nampa, Idaho.

Buffalo & Susquehanna.—An important railroad extension is said to be contemplated. The eastern terminus of the road is now at Ansonia, where it connects with the Fall Brook road. A route has been surveyed eastwardly to Wellsboro, thence on to Towanda, Bradford County, where it will connect with the Lehigh Valley. The western terminus of the Buffalo & Susquehanna is now at Keating, where it intersects with the Philadelphia & Erie road.

Buffalo Lumber Co.—The Buffalo Lumber Co. will build a railroad from Bayard, on the West Virginia Central & Pittsburgh, to the Hubbard tract on Stony River. The road will be commenced in the early spring. It will be about eight miles in length.

Butler & Pittsburgh.—Work has been begun on the tunnel through the divide between the Allegheny and Monongahela rivers. A camp has been established near Unity, on the north end of the tunnel, and about 60 men and 50 teams are making the approaches. A large part of the grading on this section of the road will be done with machinery and not more than 1,000 men will be employed. The heaviest cutting will be in the 4½ miles north of the tunnel, and the larger force of men will be located there. The contract for dredging the new ship at Conneaut Harbor, the lake terminal of the Pittsburgh, Shenango & Lake Erie, has been awarded to Hinson & Woods, of Buffalo, for \$25,000. This will extend 700 ft. inland, and will be completed before the close of winter.

Candon Lane Boom & Lumber Co.—This company, operating lumber mills at Whitmer, W. Va., will build five miles of new road, extending its logging operations. The work will be commenced by the first of the year.

Centralia & Chester.—Grading is now being done on an extension from Evansville, Ill., south to East Kaskaskia, Ill., about 10 miles. It is proposed to continue the extension to Chester, eight miles further on, and it is said that the citizens of that place have raised the money to secure the right of way.

Charleston & Macon.—Chief Engineer A. W. Swanitz has returned from Europe, and has been in consultation with the officers of the Security Construction Co. It will be remembered that the surveys for this road were completed from Charleston to Allendale, S. C., a distance of 82 miles, some months ago. But, owing to the financial condition of the country before the election, little active construction was done. There is some talk of the Construction Company building the road themselves and not by contract, as was first intended.

Chesapeake & Western.—Contractor J. B. Hayes, states that work will be resumed west from Bridgewater, Va., within two weeks. Engineers are re-marking locations from Bridgewater and timbers are being prepared for the bridge at the west of Bridgewater. J. W. Reinhart, Mills Building, New York City, is President.

Chicago & Northwestern.—The second track between Baraboo, Wis., and Madison, 37 miles, has just been completed by Winston Bros., contractors, of Minneapolis. The work was begun last January, and the cost is reported as over \$1,000,000. The lines through South Dakota and from St. Paul unite at Elroy, and the traffic from that point as far as Madison is heavy. From Elroy to Baraboo the line goes through the Baraboo Valley and is a water grade, while from Baraboo to Madison the road crosses two heavy divides, one between the Baraboo and Wisconsin rivers and one between the Wisconsin and the lakes in the vicinity of Madison. The grades here were very heavy. About 60 per cent. of the distance was improved by the rectification of grades, lowering the summits from six to ten feet. At one point the summit was lowered 23 ft. Within the limits of one mile at the Devil's Nose two reverse curves were eliminated by constructing two fills 75 ft. and 55 ft. in height, 400,000 cu. yds. of earth being used. This will give an increase in the rating of locomotives of 120 tons. Ninety-four bridges and culverts were extended for the second track or constructed for double track, while trestles to the length of 1,664 ft. were replaced by 12 permanent bridges. At a point six miles north of Madison a heavy bridge rests on piles driven 70 ft. At two points the diversion of streams made possible a saving of about \$10,000 in bridge construction. About 1,200 men were employed.

Colorado Springs, Pike's Peak & Cripple Creek.—E. L. Robinson, of Gillett, Col., Chief Engineer of this proposed narrow-gauge road into Cripple Creek, Col., gives the following route as the one adopted: From Colorado Springs westerly up Bear Creek Canon 3½ miles, and heading Red Rock Canon passes Manitou and the Seven Lakes, 21 miles from Colorado Springs and through Gillett, Big Trachyte Mountain and thence into Cripple Creek, 40 miles. The preliminary survey is completed as far as Crystal Park, 13 miles. The grade will not exceed 4 per cent., going west and about 2 per cent. east. The heaviest grade will be in the first 15 miles out of Colorado Springs and the only heavy work will be in Bear Creek Canon and through Shady Spring Gulch.

Copperfield.—This company was incorporated in Vermont last week. The road is projected to start from some point on the Connecticut & Passumpsic Rivers Railroad between Wells River and White River Junction,

and extend to mines in Orange or Windsor counties and from that point is to be extended so as to connect with the Central Vermont. This will open up a large territory now far removed from railroad facilities. The point of connection with the Central Vermont will be Barre City.

Dayton Northern.—Articles of incorporation have been filed at Lima, O. The capital stock is \$10,000, and the general office will be at Lima, O.

Duluth & Southwestern.—This road has decided to ask St. Louis County, Minn., for aid to the amount of \$250,000 in extending the line from Red Wing to Duluth. The bonds will be left in escrow with the Franklin Trust Co. of Brooklyn until December, 1900, when, if the road is completed and in operation, they are to be turned over to the railroad. They are to be 30 year bonds and payable at any time after 10 years, at the company's option. If the road is not completed by Dec. 1, 1900, the bonds are to be forfeited. This company will succeed the Duluth, Red Wing & Southern, now operating 50 miles of road.

Eastern Minnesota.—This road is renewing its road-bed between West Superior, Wis., and Sandstone, Minn., with crushed rock and gravel. It will be completed before next summer. An iron bridge will be built to replace the old wooden one over the Nemadji river, 10 miles from West Superior. The work is being pushed as rapidly as possible.

Fairmont, Morgantown & Pittsburgh.—This road, operated by the Baltimore & Ohio, is being extensively improved between Morgantown and Fairmont, W. Va., being relaid with new rails, curves eliminated, sidings changed and the line put in shape for heavy traffic and more rapid running. The road from Pittsburgh to Morgantown is comparatively new, while from Morgantown to Fairmont the line has been in use many years and is not in good condition.

Globe, Gila Valley & Northern.—Right of way has been granted this road, in Arizona, through the San Carlos Indian reservation in Arizona. Construction will be pushed from the present terminal at Geronimo and from Globe, Ariz. It is reported that the line will be in operation in 90 days. This gives great satisfaction to the mining industries of Central Arizona. The right of way was procured by a vote of the reservation Indians, it being carried by a small majority.

Golden Circle.—This road is to be extended immediately from Victor, Col., through the Cripple Creek mining region, about 10 miles. This will give the line and its controlling company, the Florence & Cripple Creek, a connection with practically every important mine in the Cripple Creek District.

Great Northern.—Surveyors are reported in the field in both Minnesota and Montana. In Minnesota the line has been surveyed across the Duluth & Winnipeg tracks at Deer River, and will, it is said, be continued east and northeast into the Mesaba range, and thence to a connection with the Eastern Minnesota.

In Montana the surveyors are at work near Rainbow Falls, in the vicinity of Great Falls. It is believed the road intends to enter the town by a new route, cutting off several miles of extra travel and avoiding a heavy grade.

Gulf & Ship Island.—A branch of about four miles from Gulfport, on the coast, to Handsboro, Miss., has just been finished. This branch is built for the convenience of shippers of lumber for export through Ship Island Harbor. All square timber for export will be shipped to Handsboro, where the fresh-water lakes and bayous afford storage room for the timber until it can be shipped.

Herman Clark and John R. Westbrook, well-known railroad contractors, of New York City, have recently been over the line with the object of considering contracts on the proposed extension of the road north to Pontotoc, Miss.

Hutchinson & Southern.—Grading has been completed from Cameron, Kan., to within four miles of Medford, Okla., and it is expected that the road will be completed to Medford within a very short time. This will give a large portion of Western Kansas a direct shipping route to the Gulf and to all Texas points.

Lehigh Valley.—The company is reported to have under consideration the construction of a branch from Quakake through the valley to East Mahanoy Junction thence to Tamaqua, Pa.

Michigan & Ohio Belt Line.—It is reported that work has been begun on this road projected to extend from Grand Haven, Mich., south into Ohio, to connect with the Columbus, Hocking Valley & Toledo, passing through Grand Rapids, Gun Lake, Prairieville, Battle Creek, Hurlington, Cold Water, California and Camden, Mich., and Pioneer and Napoleon, O. Upwards of 160 miles are graded. J. W. Boynton is President of the company.

Minneapolis, St. Paul & Ashland.—Work has begun at Ashland, Wis., on this new road, and some grading is completed. The work of laying 25 miles of rails will be begun at the dock at Ashland, and will extend to the Duluth, South Shore & Atlantic tracks.

Minnesota & Western.—Articles of incorporation have been filed in Wisconsin by this company, organized to construct a road from Emerald in St. Croix County to Spring Valley in Pierce County, a distance of 26 miles. The capital stock is \$55,000. The incorporators are C. J. Whitmore and C. D. Branam, of Boston; D. M. Sabin and E. D. Buffington, of Stillwater, and Maurice Auerbach, F. W. M. Cutcheon and William Dawson, of St. Paul. The line is a reorganization of the Minnesota & Wisconsin.

Mobile, Jackson & Kansas City.—Active work is to begin immediately on this road, and advertisement has been recently made in Mobile for 1,000 laborers. The construction camp, near Mobile, has been located. It is proposed to extend northwest to Jackson, Miss., about 180 miles. One drawbridge and considerable trestling will be necessary on the line. All surveys have been made.

Ottawa & Parry Sound.—Announcement has been made that this road will open its through passenger service between Ottawa, Ont., and the Georgian Bay on Dec. 14. The ballasting of the line was completed Nov. 25. For the winter there will be only a mixed service from Madawaska to Parry Sound.

Philadelphia & Reading.—Commencing on Dec. 7 trains are now running from Pottsville, Pa., to Frackville, Pa., and thence over the new branch just finished to Wiegands and Ashland.

Roaring Creek & Charleston.—This road will be completed from Womelsdorf, the present terminus, to Belington, W. Va., within three months. The grading is nearly all completed, and the bridges are all under way. The track-layers have reached the Staunton pike, near the middle of the line, and the new track is being surfaced and put in shape for putting on trains as soon as it is finished to Belington. Several lumbering concerns have already arranged to open mills on the new line as soon as it is opened.

Electric Railroad Construction.

Allegheny, Pa.—The new Hill-top branch of the Birmingham Traction Company's lines was opened last week, and the old Washington avenue extension abandoned. The Arlington Heights branch will be pushed to an early completion.

Bradley County, Georgia.—An application has been filed in the state of Georgia for a charter for the Chattanooga Rapid Transit Co. Among the incorporators are: Samuel W. Divine, W. B. Royster, Charles T. Divine, John W. Wyatt and others, of Hamilton County, Tennessee; J. A. McFarland and R. B. Stegall, of Walker County, Georgia. The incorporators propose to build an electric line from near Rossville, Ga., in a southerly direction for 10 miles through Catoosa and Walker counties, but no definite plans have been decided upon. The capital stock of the new company will probably be \$150,000.

Bristol, Pa.—The entire length of the electric road has been completed from Langhorne to Bristol. The fare between the two towns has been fixed at 15 cents and 25 cents for the round trip. The railroad fare for the round trip between Bristol and Doylestown is now \$2.20, but the distance has been shortened about 30 miles by the new electric line so that the round trip can be made for \$1.78. The road is about 8½ miles in length.

Chicago.—Permit has been granted to the Chicago City Railroad to use electricity as the motive power on Indiana avenue line.

Cincinnati, O.—The Cincinnati & Miami Valley Traction Co. has been incorporated with a capital stock of \$650,000. The following information has been made public: The line will be built from the present terminus of the lines of the Dayton Traction Co. at Miamisburg, through Middletown to the court-house in Hamilton. The contract has been made with Messrs. Stern & Silverman, Philadelphia, for the building of the road, including the road-bed, cars, overhead construction, power stations and car barns, and they have agreed that it will be completed by July 1, 1897. The buildings will be constructed of steel and brick, and will be fire-proof throughout. Sixty-pound rails will be used.

Hartford, Conn.—A line is projected from Watertown, Conn., which is the terminus of the Watertown branch of the Naugatuck Division of the New York, New Haven & Hartford Railroad, to Bantam Lake and Litchfield, a distance of about 12 miles. A line is also proposed from Litchfield, through Goshen to Norfolk, a distance of about 16 miles. Charters will be asked for these roads at the coming session of legislature. Surveys are now being made by T. H. McKenzie, Civil Engineer, of Hartford. Ex Senator O. N. Pierce is interested.

Lebanon, Pa.—The surveys for an extension of the Lebanon & Annville line from Annville to Palmyra, five miles, have been made and work on the construction of the road will be commenced at an early date.

Marine City, Mich.—The Union Trust Co., Philadelphia, has signed a bond for \$2,000, given to Marine City as a guarantee that the electric road between that city and Detroit will be completed by Nov. 15, 1897.

Media, Pa.—An effort is being made to have the road built from Media to Chester. Nearly all the right of way has been secured.

Moundsville, W. Va.—The final papers in the contract between Benwood & Moundsville Railway Co. and the Baltimore & Ohio Railroad for a crossing of the line of the latter at Moundsville, W. Va., have been signed by all parties, except Receiver Howard Hazlett, of the Benwood & Moundsville road. This signature will be affixed this week and cars will be running regularly between Moundsville and Wheeling in a few days. The rest of the road is completed and in operation.

New Rochelle, N. Y.—The village trustees have granted a franchise to the Larchmont Electric Co., and the work of building the new electric road to New Rochelle will begin within a few weeks.

Norwich, Conn.—The Norwich Street Railway Co. will apply to the General Assembly for an extension of time of two years within which to construct its line to New London.

Parkersburg, W. Va.—In connection with the Marietta & Williamstown Bridge Co., mentioned this week among the bridge notes, C. Jutte, August Jutte and others, of Pittsburgh, in conjunction with the Marietta, O. Street Railway Co. and the Park City Street Railway Co., of Parkersburg, propose to build a 12-mile electric railroad, connecting Parkersburg and Marietta, and pass through four towns on the route.

Patchogue, L. I.—The application of the Patchogue & Port Jefferson Traction Co. for a franchise to build a cross-island electric road on Ocean and North Ocean avenues in Patchogue, as referred to among our notes of Nov. 27, has been denied by the trustees of that village.

Peoria, Ill.—The contract for the construction of the Glen Oak & Prospect Heights Railway has been let to the Electrical Installation Co., of Chicago, which company are now progressing with the grading and track laying. The road will be completed and in operation within three months, with ten 25-ft. cars, equipped with two 30-H. P. motors of the latest and most improved type. The road is five miles long and 67-lb. 60-ft. girder rails will be used for half of the length and the same length and weight T-ee rails will be used for the remaining distance.

Plainfield, N. J.—We have been informed that the Plainfield Street Railway Co. has decided to extend its line from Somerset Street to the Mountain Park Inn on Watchung Mountain next spring.

Port Chester, N. Y.—On Dec. 1, the Board of Village Trustees unanimously granted a franchise to the Port Chester Street Railway Co., referred to among our notes Oct. 2. Work will be begun this fall.

South Bethlehem, Pa.—Councils will settle the suits against the Lehigh Valley Traction Co., provided cer-

tain conditions, one of which demands an extension to Hellertown, are complied with.

Wabgon, Ont.—It is proposed to build an electric road from Wabgon, on the Canadian Pacific Railroad, to the coal fields of the Rainy River District, a distance of about 75 miles. It is proposed to use water power for generating the electricity, and it is probable that construction work will be begun as soon as the charter has been obtained.

Webster, Mass.—A company is being formed by John Flint, L. R. Eddy, E. L. Spalding and others, of Webster, to build an electric road from Webster to Worcester. It is stated that franchises will be applied for during the season of the legislature this winter.

GENERAL RAILROAD NEWS

Atchison, Topeka & Santa Fe.—Judge Foster, of the United States Circuit Court, after hearing arguments in the Kansas receivership case, decided to ask Judge Thayer to sit with him, and requested a re-argument of the case, which was had last week. A decision was handed down Dec. 7, in effect that the federal courts would not be warranted in taking jurisdiction of the controversy until the case should come before them in the regular course of procedure, and remanding the case to the Kansas courts. Attorneys for both sides have agreed that the case shall be argued and decided on the following points: (1) General denial; (2) That not more than 20 per cent. of the stock was owned by aliens at the time the Atchison property was purchased by the new company; (3) That the "Alien Land Act" was never legally passed by the Kansas Legislature; (4) This act impairs the obligations of contracts between the United States and the railroad company; (5) The act is unconstitutional, if it did pass; (6) That the value of the property affected by the suit is \$18,107,480. The case will be first heard in the District Court. If a decision is there rendered adverse to the corporation, the case will be taken to the Kansas Supreme Court, and to the United States courts from there, if necessary. Judge Myers, of the State Court, has agreed to suspend the Receiver until the case has been decided on the law points involved.

Atlantic & North Carolina.—The injunction which was obtained a week or two ago to prevent the proposed lease of this road, which is controlled by the State of North Carolina, to a proposed syndicate organized under the head of the Goldsboro & Moorhead City Railway Co., for this special purpose, has been further continued by the State Court. This seems to effectually dispose of the plans for leasing the road, as a Republican Governor with a new legislature in opposition to the lease will come into power January.

Atlantic & Pacific.—A press dispatch was sent out from Phoenix, Ariz., last week stating that a party of St. Louis & San Francisco officials and capitalists were inspecting this road. It was also stated that a large amount of the stock had recently passed into the control of the St. Louis & San Francisco and that it was likely that the latter company would be a bidder for the property at the foreclosure sale, with a view of building from the present western terminus of the Central Division of the Atlantic & Pacific, at Sapulpa, I. T., to Albuquerque, N. Mex., to a connection with the Atlantic & Pacific and thus shut out the Atchison from its California lines. This would be carrying out the original plan of a through line from St. Louis to California, which was abandoned when the Atchison acquired possession of the St. Louis & San Francisco, and undoubtedly could be done if the latter's security holders are willing to pay the price. There does not seem to be any better foundation for the report than the reporter's imagination.

Atlantic Short Line.—Judge Speer, at Macon, Ga., has ordered the sale of this road at Swainsboro, Emanuel County, Dec. 17. The sale is to be without a minimum price and will be conducted by John R. Young, of Savannah, Receiver. The road was offered at public sale at Swainsboro about three months ago with a minimum price of \$210,000, but there was no bid.

Chicago & Eastern Illinois.—The company assumed formal possession of the Chicago, Paducah & Memphis road on Dec. 1. This road extends from Marion to St. Elmo, Ill., and by January the line will be further completed to Shelbyville, where it will connect with the Chicago & Eastern Illinois. Through trains from Chicago to Marion will be put on as soon as this connection is made.

Chicago & Lake Superior.—The road between Cambridge and London, Wis., over which the first and only train was run about one year ago, will be sold at public auction Dec. 14 to raise \$7,600 to pay the labor claims.

Cincinnati, Jackson & Mackinaw.—Jan. 5 has been decided upon as the date of the foreclosure sale of this road recently ordered by the United States Circuit Court. The sale is to be held at Van Wert, O.

Denver & Rio Grande.—The directors have declared a dividend of one per cent. on the preferred stock, payable Jan. 15. The earnings for four months ending Oct. 31, 1896:

Net earnings	\$1,072,187.63
Four months' taxes, interest and all other charges	781,985.23
Surplus for four months	\$290,202.40
Dividend one per cent. on preferred	236,500.00

Detroit, Grand Rapids & Western.—The Detroit, Lansing & Northern, and the other roads which it controls and which were recently sold at foreclosure, have been reorganized under the above name. The new company is capitalized at \$5,693,500, of which \$3,183,500 is preferred stock.

Kentucky & Indiana Bridge Co.—Judge Barr, of the United States Court, has ordered the sale of the property, which consists of a bridge across the Ohio terminals, the New Albany Belt Road, and the New Albany street car lines, under foreclosure of the \$3,000,000 of bonds. The Baltimore & Ohio Southwestern and the Monon will probably be the purchasers.

Lehigh Coal & Navigation Co.—The company has arranged with Messrs. Brown Brothers & Co., of New York City, for the extension of the \$2,000,000 railroad loan six per cent. bonds which fall due on Feb. 1 next. This loan is a first lien on the lower section of the Lehigh & Susquehanna road, which extends from Mauch Chunk to Phillipsburg, N. J., 46 miles of double track, including the bridge over the Delaware River, third and fourth tracks and branches in addition 35 miles.

Lima & Honeoye Falls.—The road was sold at public auction in Lima, N. Y., to H. C. Gilbert, as trustee for the bondholders, for \$6,000. The road was built to connect with the New York Central line and Honeoye Falls,

but it has for some time past been only irregularly operated.

Louisville & Nashville.—The company has arranged with Kuhn, Loeb & Co., Speyer & Co., and Vermilye & Co., of New York, for the sale of \$3,258,000, Louisville, Cincinnati & Lexington general mortgage gold bonds, interest reduced to 4½ per cent. now being a part of its treasury assets. Of the proceeds of these bonds, \$2,850,000 will be used to redeem a like amount of first mortgage bonds of the Louisville, Cincinnati & Lexington Company, maturing Jan. 1, the balance being covered into the Treasury. In return for the Treasury holdings thus sold, an equal amount of unified bonds, to be issued in place of the maturing Louisville, Cincinnati & Lexington first mortgage bonds, go into the Louisville & Nashville's treasury.

Minnesota & Wisconsin.—This road, operating from Emerald, Wis., to Wilwood and Spring Valley, connecting with Omaha and Wisconsin Central, which was sold under foreclosure last summer to the St. Paul Title & Trust Co., as trustee for mortgage bondholders, has been reorganized under the same name, and final transfer was made by D. B. Dewey, Receiver, on Dec. 2. The officers are E. D. Buffington, Stillwater, President and Manager; William Dawson, St. Paul, Vice-President; James W. Jones, St. Paul, Secretary, and Herman Scheffer, St. Paul, Treasurer.

Newfoundland.—A report from St. Johns states that the colonial government has purchased all the rights of this company, which have been before courts for several years. The rights include a 22 years' mail subsidy and \$45,000 yearly allowance for rolling stock and mineral lands owned by the company. The price paid by the government was about \$1,500,000. The transfer will take effect at the beginning of the new year.

Northeastern (Georgia).—A bill was introduced in the Georgia Legislature last week authorizing the sale of the road at an upset price of \$287,000. This is the amount of the state bonds on the road. The road is now operated by lessees.

Owensboro, Falls of Rough & Green River.—Judge Barr, of the United States Court, at Louisville, last week issued an order for the sale of this short road in Kentucky at an upset price of \$150,000. It is about 40 miles long, extending out of Owensboro.

Pennsylvania.—The company has recently negotiated the sale to Speyer & Bros. bankers, of New York, loans of \$1,300,000 4 per cent. 40-year gold bonds, secured on the new Delaware River Bridge at Bridgeburg, near Philadelphia, and \$1,400,000 4½ per cent. 50-year gold bonds, secured on the Ohio River bridge at Pittsburgh.

St. Louis, Kansas & Southwestern.—Dwight Braman, lately appointed Receiver of this road, the Anthony branch of the St. Louis & San Francisco, an abandoned line, has leased rolling stock of the Atchison, Topeka & Santa Fe Railroad Company, and will commence to operate the property within a week.

Southern.—The company has declared, out of accumulated earnings, a dividend of one per cent. on its preferred stock, payable Jan. 4. The statement is made by the company that this dividend has not been declared as an annual dividend, but as a distribution to the preferred stockholders of a portion of the surplus earned in the last two fiscal years. It is not the purpose of the Board at this time to consider the policy of future dividends. They will depend, of course, upon the results of the operation of the property and the general financial conditions surrounding it. This dividend would have been declared at the close of the last fiscal year but for the political and financial conditions then existing, and the consequent necessity for conservatism at that time.

Union Pacific.—John G. Moore, James W. Alexander and Edwin F. Atkins, at the request of holders of the 6 per cent. collateral trust notes, have undertaken to act as a committee to devise a plan and formulate an agreement of reorganization. On and after that date the Mercantile Trust Co. will receive deposits of the notes subject to the terms of the plan and agreement.

Electric Railroad News.

Baltimore, Md.—At a meeting held Dec. 3, the directors of the City Passenger Railway Co. decided on the sale of \$500,000 certificates of indebtedness to the Mercantile Trust & Deposit Co. The money will be used to pay off a floating debt and for proposed improvements.

Boston.—The West End Street Railway Co. has leased the subway for 20 years at 4½ per cent. per annum on \$7,000,000, estimated cost of the subway. The special meeting of the stockholders to consider subway contract will be held Dec. 15.

Lancaster, Pa.—Wm. B. Given, of Columbia, who was appointed Receiver of the Pennsylvania Traction Co., will consider the advisability of increasing the capacity of the power plant. Receiver's certificates will be issued to defray the expenses. Negotiations were closed about the first of August of this year for a transfer of the controlling interest in this stock to a New York syndicate headed by George L. Lee.

Pittsburgh, Pa.—The North Side Traction Co. has made an offer for the purchase of the property of the Pittsburgh, Allegheny & Manchester Traction Co. A meeting of the stockholders of the latter road will be held in a short time to consider the sale.

Wilmington, Del.—The Chester & Wilmington Electric Railway Co. will be required to show cause by Dec. 8 why a Receiver should not take charge of the road. This company was incorporated May 3, 1893, with a capital of \$50,000 to build a line from Chester, Pa., to Wilmington by way of laymont, but no construction work has ever been done on the proposed line.

TRAFFIC.

Traffic Notes.

It is reported that the Louisville Car Service Association, which was disbanded last March, will soon be reorganized.

At Waco, Tex., recently a car of the Missouri, Kansas & Texas was loaded with 153 round bales of cotton, weighing 65,160 lbs.

The Lehigh Valley has put on a new passenger train from New York to Buffalo, starting at 8:30 p. m., and running through in 11½ hours.

The Pennsylvania has applications for storage room for 250 sleeping-cars, at Washington, March 4, but has room for only about seventy-five.

Traffic at Galveston is unusually heavy. The Atchison has recently been obliged to detail 10 extra locomotives to the Gulf road, in order to enable it to handle the business offered.

The Atlanta (Ga.) Constitution reports that the railroads carrying freight to the City of Mexico, the Mexican National, the Mexican Railway, the Mexican Central and the Inter-Oceanic, which have recently re-established their pool on freight coming from Europe, have agreed to pool the freight coming from the United States if the European agreement proves satisfactory.

The competition between the Southern Pacific Railroad and the ocean steamships carrying passengers between San Francisco and Portland, Or., which, about a year ago, led to radical reductions in fares, continues active, and the Southern Pacific runs a special through train on the days that the steamers sail. The second-class fare on this train, which includes a sleeping-berth, was, on Dec. 3, advanced from \$10 to \$12.

Grain Movement Through Buffalo.

The Erie Canal was closed for the season on the night of Dec. 1. During the seven months that the canal has been open this year the number of boats clearing from Buffalo has been 5,876. The receipts of grain at Buffalo by lake from the opening of lake navigation to Dec. 1 this year were 154,338,921 bu., which is about 50 per cent. more than the receipts of the previous season. The receipts of flour have been 9,245,790 bbls., as compared with 7,900,450 last year. Shipments by canal from Buffalo for the season were 35,868,996 bu. of grain, as compared with 20 millions in 1895 and 48 millions in 1894. The shipments of flour this year were 64,552 bbls. For several years past the shipments of flour have been practically nil. The local papers state that the resumption of flour shipments by canal this year has aroused the railroads, and that they have largely increased their storage facilities for flour at Buffalo.

The shipments of grain from the Buffalo elevators eastward by rail for the 11 months of the current year amounted to 108,281,620 bu., probably the largest amount ever so shipped. In 1895 the total was only about 84 millions, and in 1894 only 31 millions. Canal rates have been pretty well maintained this year, the agreement of the boatmen, made early in the season, having been quite successful. The rates by lake and by canal on the last shipments in November were as follows:

	1896.	1895.
	Cts.	Cts.
Coal, ton, Buffalo to Chicago	60	9
Corn, bushel, Chicago to Buffalo	1½	2¼
Wheat, bushel, Duluth to Buffalo	2	6
Corn, bushel, Buffalo to New York	3¼	2¾
Wheat, "	3½	3

The Buffalo Custom House reports the following shipments from that city by canal for the month of November:

Roads, feet	7,345,756
Wheat, bushels	1,146,614
Corn, "	765,116
Barley, "	1,418,329
Flaxseed, tons	21,544
Iron and steel, tons	775
Pig iron, tons	980
Coal, anthracite, tons	849
Railroad iron, "	858
Lead pig, tons	786

The receipts at Buffalo by canal for November (in tons) included the following:

Iron ore	676
Hemp	1,183
Sugar	1,160
Molasses	579
Merchandise and sundries	21,638
Stone, lime and clay	16,303
Coal, anthracite	983

Chicago Traffic Matters.

CHICAGO, Dec. 9, 1896.

The first complaint to come to the new Board of Administration of the Western Freight Association is a joint one from the Northwestern, the Burlington & Missouri River and the Missouri, Kansas & Texas. All three petition for a larger percentage of the total competitive business, and their claims are being considered by the board.

The Southern Pacific has finally agreed with the other transcontinental lines to abolish all excessive commissions on immigrant business on Jan. 1.

The Michigan Central is making arrangements to run fast freight trains between New York and Chicago. The trains will be scheduled at 60 hours for the trip.

Western officials are much pleased with the decision of the Board of Managers to allow all eastbound lines from this city to join their Western connections in meeting Canadian Pacific competition in eastbound excursion business from the Northwest. The Soo has again reduced its rates on this business.

The Western roads have failed to reach an agreement regarding the grain-in-transit rates from the Missouri River. It is believed, however, that some arrangement will soon be fixed up.

Freight Traffic Manager Johnson, of the Rock Island, has been elected Chairman of the new Rate Committee of the Western Freight Association.

Total eastbound shipments by lake last week, were 52,843 tons, of which 43,735 tons were grain. Total all-rail shipments were 72,166 tons, compared with 61,866 tons for the preceding week, an increase of 10,300 tons, and against 72,672 tons for the corresponding week of last year. The all-rail traffic was carried by the different lines in the following proportions:

Roads.	WEEK TO DEC. 5.		WEEK TO NOV. 28.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	8,919	12.4	6,472	10.5
Wabash	6,106	8.5	5,806	8.2
L. S. & M. S.	9,103	12.6	7,321	11.8
Pitts., Fr. Wayne & Chicago	6,660	9.2	4,610	7.4
Pitts., Cin., Chi. & St. Louis	7,781	10.8	6,824	11.0
Baltimore & Ohio	8,611	11.9	7,795	12.2
Grand Trunk	5,304	7.3	6,289	10.2
N. Y. C. & St. L.	6,532	9.1	5,615	9.1
Erie	7,821	10.8	6,851	11.1
C., C. & St. Louis	5,309	7.4	5,003	8.1
Totals	72,166	100.0	61,866	100.0

Of the above shipments 5,152 tons were flour, 37,686 tons grain, 9,912 tons provisions and 8,703 tons dressed beef.